SCIENTIFIC AMERICAN

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A NOTABLE PAIR OF HORIZONTAL TURBINES.

What is probably the largest and most powerful pair of horizontal turbines, for the head of water under which they will operate, that has ever been built, has recently been erected by the Dayton Globe Iron Works Company, for the Boston and Montana Consolidated Copper and Silver Mining Company, of Great Falls, Montana.

These turbines, of which the leading details are shown in the accompanying illustrations, are of what is known as the new American pattern, and they differ from other machines of the same design merely in the great size and mass of their parts. The two turbines, which are each 57 inches in diameter, are placed horizontally at the ends of a cast iron draught chest, and discharge centrally through a plate iron draught tube 10 feet in diameter. The turbines and the draught chest are inclosed within a huge cylindrical flume, 14 feet 4 inches in diameter and 32 feet 6 inches long. The body of the flume is built of ½ inch tank

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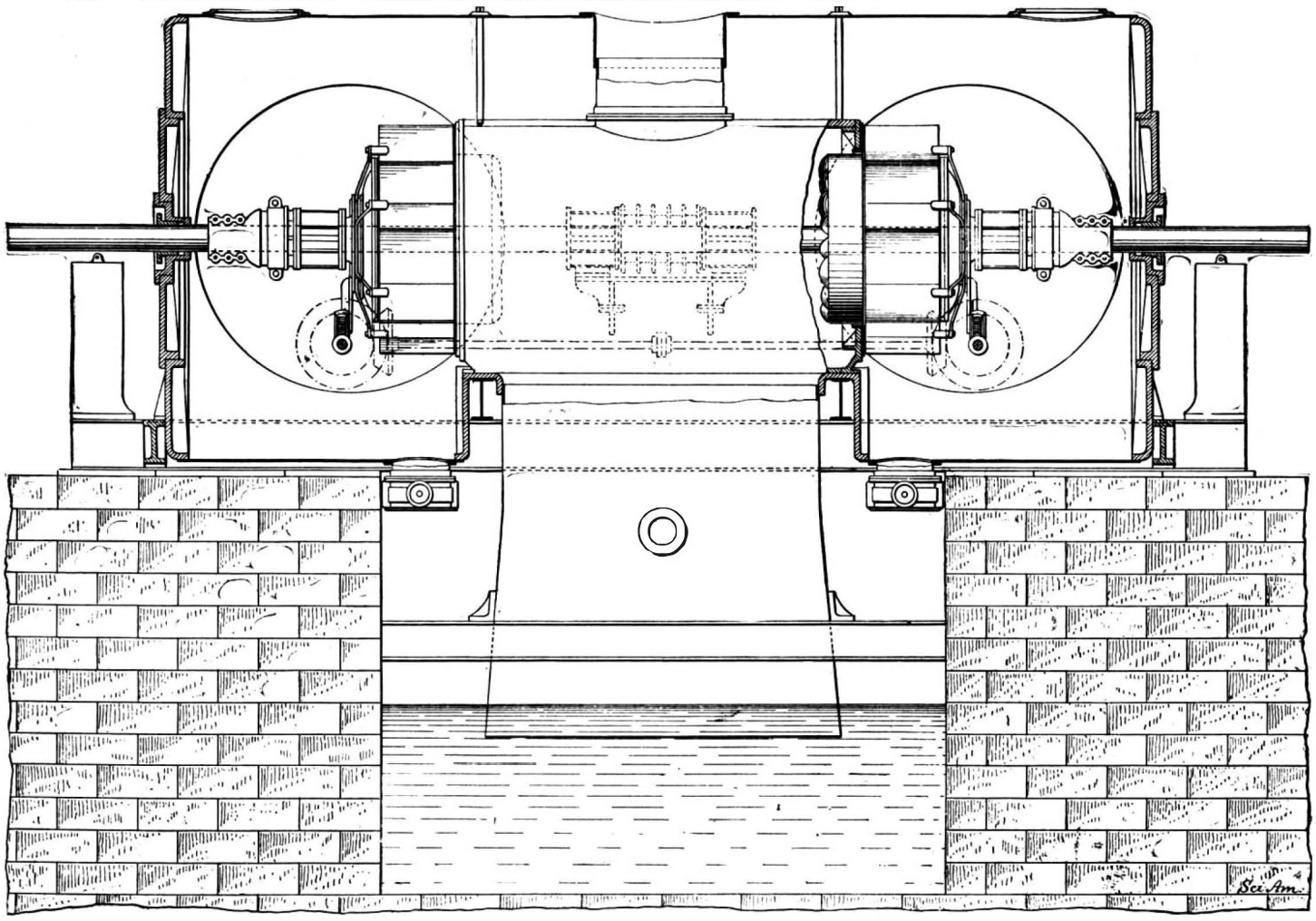
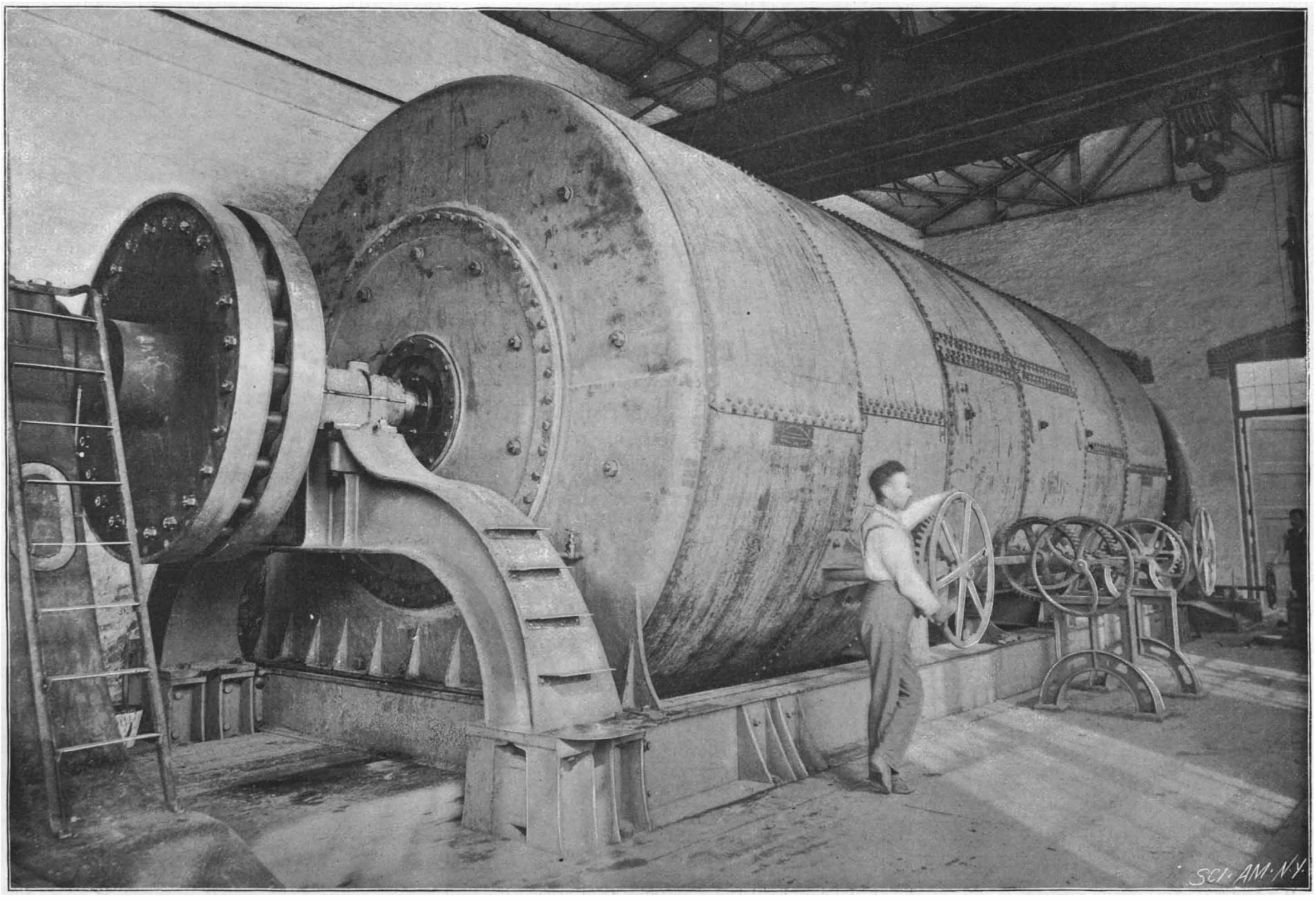


VERTICAL SECTION SHOWING FLUME, DRAUGHT CHEST AND 57 INCH TURBINES.



THE STEEL FLUME, 14 FEET 4 INCHES DIAMETER, 32 FEET 6 INCHES LENGTH.

POWERFUL HORIZONTAL TURBINES AT GREAT FALLS, MONTANA.

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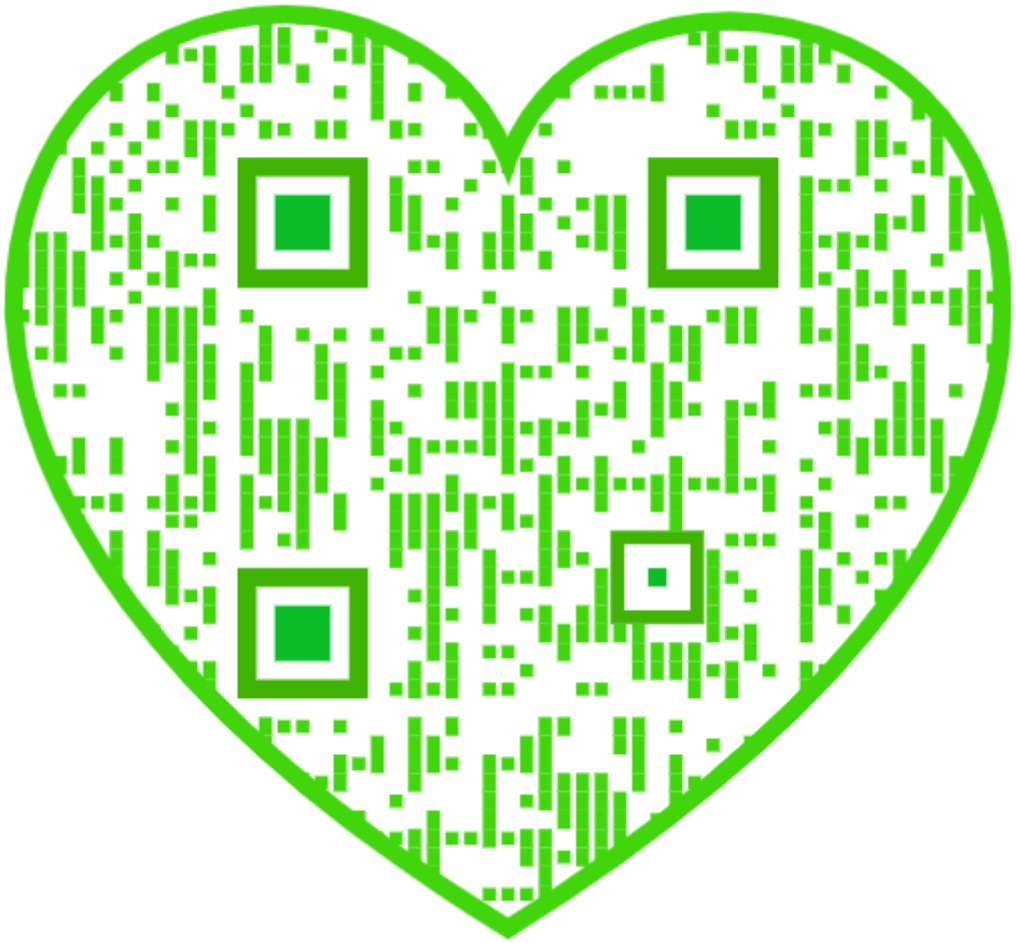

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DELAY OF NEW YORK RAPID TRANSIT.

It is doubtful if the gentlemen who compose the Supreme Court Commission have ever carried a more serious responsibility than that just now incurred in deciding the fate of the plans for rapid transit which were prepared by the New York Rapid Transit Commission. It is now about eighteen months since the first set of plans were rejected by this court, mainly on the ground that the cost was too great. In the interim the commission has gone carefully into the question, with the intention of offering amended plans to the court which should embody its suggestions and avoid the objections raised by the justices. The amended plans have cut down the total cost one-half, or from about sixty million to less than thirty million dollars, and the grievances of property holders on Broadway have been met by abandoning that thoroughfare altogether and adopting a parallel route on Elm Street. It is to be hoped that a decision will be rendered at the earliest possible date, for the reason that the consolidation of the present several municipalities which will constitute Greater New York will take place on the first day of January, 1898, and if the immediate construction of the proposed lines is to take place, the contracts must be let before that date.

With the close of the year the present governing bodies of the city will cease to exist, and before any progress could be made with rapid transit it would be necessary to form a new commission and begin over again the tedious preliminary work.

Should the judgment of the commission be unfavorable or should it be rendered too late for the commencement of construction, the city will find itself exactly where it started many years ago, and all the time, trouble and expense to which it has been put will have gone for nothing.

A new and certainly unlooked for obstruction has developed in the recent action of the Park Board. Before the road can be built it is necessary to secure not only the consent of the Supreme Court Commission but also of the Park Board, the latter having the power of veto as regards such part of the route as passes under the public parks. This is a wise provision, and in this case the Park Board has suggested that the location of the loop at the Battery be changed so as to avoid certain large trees which are over the site of the proposed structure. Under ordinary circumstances the change could no doubt be made, the curve being swung a little one way or the other for the purpose. As it happens, however, the law does not permit any change to be made in the plans after they have once been approved by the Mayor and the Board of Aldermen, and if the Park Board should insist upon this revision of the line, small as it is, the whole work of securing the necessary consent will have to be gone over again. But this is a slow process, and the delay (for reasons given above) will imperil the success of the whole scheme. This being the case, it becomes a question between the sacrifice of a few trees at the Battery and the indefinite postponement of a great public work of which the city stands in sore need. None can be more solicitous than we are for the extension of tree planting in this city and the preservation of the few that we have; but in the present dilemma we think the few trees which are threatened at the Battery should not stand for a moment in the way of an urgent public necessity affecting the welfare of the capital city of the country.

It was only a few months ago that we were urging the Board to remedy defects in the Harlem Speedway which threatened the life of every tree that might be planted therein. If the Board will be content to sacrifice the two or three trees at the Battery to a great public necessity, and direct its energies to removing the impediments to the growth of trees on the three mile planting spaces of the Speedway, it will serve the present and future interests of New York City to far better effect than by its present well meant but ill advised obstruction of rapid transit.

In our last issue we illustrated the handsome subway recently opened in Boston—a work that was not projected until some years after the Rapid Transit Commission of New York had commenced its labors. It is mortifying to reflect that, even at this late hour, the consummation of a similar work in the metropolis is in danger of indefinite postponement.

THE SAFETY OF THE MODERN ELEVATOR.

The recent fall of an elevator in one of the most modern of the New York office buildings, details of which are given on another page, has again directed public attention to the question of the safety of elevators in general, and it is possible that a degree of uneasiness may be excited which is out of all proportion to the event. The comparative novelty of the elevator and the fact that it carries its passengers in midair invest it with ideas of greater risk than are commonly associated with other methods of conveyance, as by train, car or steamship. As a matter of fact, statistics show that, for the number of passengers handled, the accidents are fewer on first class elevators than upon street car lines or railroads. It is claimed that the American Tract Society building elevators alone handle more passengers in one day than leave and enter New York in the same time over the tracks of the New York Central Railroad; and it is a fact that the total number of elevator passengers on all the elevators of the city per day is many times greater than the total number of passengers entering or leaving New York City in twenty-four hours. The loss of life, in proportion to the number of passengers carried, is, however, remarkably small, the average fatalities in bona fide passenger elevators due to defects in the same for the past few years in New York City being scarcely one per year—a figure which gives an extraordinarily small fraction of one per cent per annum on the total number carried.

The disablement or loss of life which results from the fall of an elevator is directly due to the same physical cause—suddenly arrested motion—as that which occurs in a railroad collision; yet the passenger who steps aboard an elevator with a passing thought as to the distance he is suspended above ground, will sit with perfect equanimity in a railroad car that is rushing through a crowded train yard at a speed of from eighty to one hundred feet a second.

To win the public confidence and maintain it is the first care of the leading manufacturers of elevators, and there is no part of the mechanism that shows such careful thought as the devices which guard against an actual fall or a too rapid descent of the car. In most cases, where the safety devices have failed, it will be found that the mishap was due to ignorance or carelessness on the part of the operators or engineers. The efficiency of the most perfect device is, after all, largely determined by the human element, which is more or less inseparable from the operation of all so-called automatic appliances. The owners of such buildings as this should exercise the greatest care in the selection of the mechanics who are responsible for the oversight of the elevator mechanism; and they should select men who are capable not merely of running the plant in its normal operation, but of safely adjusting it in all cases of emergency.

WHEAT AS A SOURCE OF PROSPERITY.

"It is an ill wind that blows nobody good," and while we sincerely regret the loss which has fallen upon less favored countries, it is certainly for us a fortunate coincidence that the abundance of our own harvests this year should have been marked by a simultaneous scarcity in the other wheat growing countries of the world. Not only has the comparative failure of foreign crops raised the price and increased the demand in the great importing countries, but a favorable season has so filled our granaries that the United States and Canada will have no difficulty in supplying their share of the 411,200,000 bushels which the best authorities claim will be the probable requirement of European countries. Their probable export this year will be 360,000,000 bushels, which would be 202,000,000 bushels more than was ever before exported from these countries to Europe, and an increase of over one hundred per cent above the exports of the year ending July 31, 1897. With wheat at a dollar a bushel, the truly enormous wealth that will be poured into the lap of the farmer is at once evident.

From such figures as these, it is easy to realize how vastly the prosperity of the country is affected by the prosperity of the farmers. The wealth which has come so suddenly—and to thousands of our farmers the harvest will bring a positive fortune—will much, if not most of it, be circulated broadcast through the land. It will go, and has already gone, to pay off the mortgage which has hung like a millstone about the neck of the husbandman. It will be spent in the purchase of much needed machinery, in the rebuilding or repair of farm buildings and in the fencing of lands. The payment of long standing debts at the country and city stores will lighten the burden upon retail dealers, and in wholesale warehouse and retail store the pulses of trade are already beating with something of their old-time vigor. The orders that are flowing in from the various jobbing houses will be followed by heavy shipments of goods throughout the country, and thus the railroads, which have already profited by the transportation of the wheat, will profit again by carrying the merchandise which the wheat has enabled the farmer to purchase. To the increased activity of the various manufacturing industries which supply this increased demand must be added the greatest boon of all—a restored commercial confidence and a quickened credit.

From a contemplation of present good fortune it is natural to look forward and ask what are the prospects for the future. Are we to lapse again into the old stagnation or can we reckon upon a continuance of some degree at least of the present agricultural prosperity? The question has been recently discussed in a comprehensive address before the Pennsylvania State Millers' Association by Dr. William P. Wilson, director of the Philadelphia Commercial Museums. The address is given in full in the current issue of the SUPPLEMENT. In addition to its very complete statistics of the export trade in wheat and flour, the address comprises an exhaustive review of the conditions of the countries from which the world's supply of these staples is derived.

It is encouraging to learn that during the last five

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years the United States have provided the same proportion of the world's total exports as they have during the past twenty-five years, and this in spite of the fact that new wheat producing countries, such as Argentina, Australia, and Roumania, now contribute their share to the total export trade. This is shown by the fact that while the average annual exportation of wheat and flour from all countries for the past twenty-five years has been 253,000,000 bushels, and from the United States 111,000,000 bushels, the annual exportation for the past five years from all countries has been 345,000,000 bushels and from the United States 164,000,000 bushels.

Dr. Wilson is of the opinion that the future market for the surplus flour of this country will lie in the countries to the south of us, South Africa and the Asiatic countries, while European countries will probably import our wheat and make their own flour. We are evidently taking a strong hold on the South African market, which, against an importation of only $111,750 worth of flour in 1895, showed an importation of nearly $1,000,000 worth in 1896, the figures for March, 1897, showing, in turn, an increase of 300 per cent over those for the same month in 1896.

Without entering more fully into the figures of this very timely address, we may mention that Dr. Wilson gives some account of the capabilities of Argentina, our greatest competitor in wheat raising. It seems that there are 240,000,000 acres suitable for the cultivation of wheat, and that while the northern districts are tropical, the whole of the middle part is temperate, and the southern districts are not as cold as the wheat districts in the United States—frost and a little snow being only occasional. Of the 240,000,000 acres suitable for wheat growing, only a little over 7,000,000 acres are devoted to wheat. Twenty years ago Argentina imported wheat and flour, yet in 1894 she exported 59,000,000 bushels of wheat and 459,527 barrels of flour. The cost of production is estimated at 33 cents a bushel, and the average freight to Europe is only 15 cents a bushel. The average distance to the seaboard by rail is one hundred miles, as against one thousand miles in this country. The producer is also favored by the low cost of living, the small farmers (chiefly Italians) living on a scale of frugality impossible to Americans, and the whole family, even to the small children, assisting on the farms. They have no barns, and the stations rarely have warehouses; hence the crop deteriorates before reaching the seaboard. When they have better facilities for handling, they will produce the wheat at even less cost.

If we are to build up a trade with countries other than European, as we probably shall be driven to do in the near future, we must go to work systematically and study the conditions, the supply and demand, the freight and duties, and the standing of the various import houses. There is a danger lurking in this sudden rush of good fortune—a danger which threatens not merely our agricultural, but the whole of our industrial interests. We are liable just now to lose sight of the permanent necessity for extending our markets, not merely for wheat, but for all of our manufactured products as well. The past few years of depression have not been an unmitigated evil if they have taught us the necessity for establishing new markets in which to dispose of our ever growing surplus. It would be a most unfortunate outcome of this year of plenty if it should relax our efforts by suggesting that the need for aggressive action had passed by.

OUR LIBRARY OF ELECTRICAL BOOKS.

The thousands of books on electricity that have been brought out during the last twenty years make it difficult for one who has not given the matter much attention to choose judiciously, in taking up the subject, as to the best works to commence with. In our library of electrical works, by Prof. Sloane, fully described in our advertising columns, we think the reader, whether young or of mature years, whether a professional and practical electrician or one just taking up the subject, will find more and better arranged information and intelligent comment than can be found anywhere else in so compact and serviceable a form and afforded at so low a price. Prof. Sloane has primarily labored to present every side of the subject in as simple a form as possible, devoid of every unnecessary technicality. In "Electricity Simplified" (158 pages, illustrated) this is especially apparent, for all the leading phenomena of electrical work and development are here fundamentally treated of, answering the questions that perpetually arise, so far as the best scientists of the day can do so, and yet in such a way that it is no labor to follow the writer from beginning to end of the book. "The Arithmetic of Electricity" (138 pages, illustrated) is not the dry, hard matter one usually looks for in such books, but electrical calculations are here reduced to a series of rules, all of the simplest forms, each illustrated by one or more practical problems, and all so plainly set forth that the subject may be readily mastered by one who has had only the most ordinary educational advantages. In "Electric Toy Making" (140 pages, fully illustrated) one is instructed how to make at home a great variety of simple electrical apparatus, motors, dynamos, batteries, magnets and instruments in general for practical use as well as for amusement, while at the same time gaining a practical knowledge of the subject that could in no other way be so effectively attained. "How to Become a Successful Electrician" (189 pages, illustrated) is a book designed to answer just the questions which daily come into the minds of thousands of young people while at school or perhaps just starting out in life, pointing out the elementary requirements and smoothing the way for the attainment of success without the great outlay which so many have found an insurmountable obstacle. "The Standard Electrical Dictionary" (682 pages, 393 illustrations) has just been thoroughly revised and brought up to date, and is absolutely indispensable to all who have anything to do with electrical work, from the most competent expert to the ordinary workman. It is a hand-book of reference almost as much as it is a dictionary, containing a vast amount of well arranged information. The whole series of books is beautifully printed and bound in handsome style. See the "special offer" in relation thereto in our advertising columns.

LELAND O. HOWARD, PH.D., PERMANENT SECRETARY AMERICAN ASSOCIATION OF SCIENCE.

BY MARCUS BENJAMIN, PH.D.

It has come to be almost axiomatic that the permanent secretary of the American Association for the Advancement of Science is better known to the scientific men of this country than any other single man. It was therefore not without considerable anxiety that the rumor of the proposed resignation of Prof. Frederic W. Putnam was heard at the recent Detroit meeting. But when that rumor culminated in reality there was found a man who, in the minds of many of the members of the association, would come as near filling the

LELAND O. HOWARD, PH.D.

office soon to be vacated as could be expected. It will not be amiss, perhaps, in this connection to say that at the meeting of the council of the American Association, when the resignation of Prof. Putnam was received and after he was advanced to the higher office of president, in considering the question of his successor, he named the duties to be performed, pointed out the difficulties to be overcome, and indicated the qualifications necessary for his successor to possess. It was then that Prof. Gill promptly rose to his feet and exclaimed that Prof. Putnam must have had in mind Doctor L. O. Howard, of Washington, as he spoke. This suggestion so aptly put was promptly acted on and the nomination ratified by the association on the morning following.

Dr. Leland O. Howard is the son of Ossian G. Howard and Lucy Dunham Thurber, of Ithaca, N. Y. His father, as a young lawyer, had settled in Rockford, Ill., and there, on June 11, 1857, the future entomologist was born. A year later his parents returned to Ithaca, and there young Howard was educated, first in a private school and then in Cornell University, where he was graduated in 1877 with the degree of B.S.

As a boy he had shown much interest in natural history, making a specialty of insects, of which he gathered a large collection, and while an undergraduate in Cornell he was allowed to do special work in the department of entomology under the direction of Prof. John H. Comstock. Although devoted to his specialty, he was advised to study medicine, and accordingly for a year after graduation he took special courses in comparative anatomy and chemistry, intending to enter the College of Physicians and Surgeons in New York City in the autumn of 1878. During the summer the fact was developed that Prof. Charles V. Riley, entomologist of the Department of Agriculture, in Washington, D. C., was in need of an assistant, and friends promptly recommended the young and enthusiastic Howard for the place. He accepted the office and has since remained there, succeeding Prof. Riley as entomologist of the United States Department of Agriculture on June 1, 1894, and still later, on October 31, 1895, succeeded his distinguished chief as honorary curator of the department of insects in the United States National Museum.

During the nineteen years that he has been in Washington he has been exceedingly active in entomological work, an account of which is quite impossible in this place; but, if he has any specialty, it is that of the parasitic hymenoptera, in which branch he has devoted special attention to habits and host relations. In recent years, as chief of the department, his investigations have been mainly connected with economic entomology, as his very many papers contributed to the publications of the Department of Agriculture abundantly testify.

In 1883 his alma mater conferred the degree of M.S. on him after a rigid examination, and for which he submitted an elaborate thesis. The degree of Ph.D. was conferred on him by Georgetown University in 1896, in recognition of his contributions to his favorite science.

In this very brief sketch of Dr. Howard's scientific work there is no apparent reason why he should have been chosen to succeed Prof. Putnam. It is, therefore, to other incidents in his career that we must look for its explanation. For some years he has been secretary of the Cosmos Club, in Washington, and in that capacity, by his unfailing courtesy, he has made for himself numerous friends, not only in the club itself, for that goes without saying, but among the many distinguished visitors who come to the capital yearly from every part of the world. Nor is this all, for he has been secretary of the Entomological Society of Washington, and was its president in the years 1886 and 1887. In other scientific organizations he has also been active, and since last December has been president of the Biological Society of Washington. In 1894 he was president of the Association of Economic Entomologists, and in 1892-93 he was secretary and treasurer of the Society for the Promotion of Agricultural Science. Of his connection with the American Association for the Advancement of Science a little more must be said. He joined the association at its second Cleveland meeting in 1888, and a year later was advanced to the grade of fellow. The section on zoology is the one with which he naturally allied himself, and in 1893 he served as its secretary. At the Springfield meeting, three years ago, he was called to the presidency of the section in place of Prof. David S. Jordan, who was unable to attend, and he was named by the council at the meeting in Detroit this year to succeed the late Dr. G. Brown Goode as president of the section.

His bibliography is very extensive, although for the most part it consists of contributions in his specialty to government reports; still he has been a frequent contributor to scientific journals and was the editor of Insect Life, a journal published for some years by the Department of Agriculture. He prepared the definitions in entomology for the Century Dictionary, and was similarly connected with the Standard Dictionary, and has also contributed to the Standard Natural History.

That Dr. Howard has knowledge, experience and tact has been sufficiently demonstrated by the foregoing brief sketch of his career, and his colleagues in Washington believe that the same skill and good judgment that he has always shown in the past will serve him in his newer and more trying office; so, when the time comes to look for his successor—and may it be far distant—the name of Howard will be a worthy addition to those of Baird, Lovering and Putnam, his three illustrious predecessors.

ORIGIN OF THE AMERICAN INDIAN.

Reports from Victoria, B. C., state that Dr. F. Boaz, who for ten years has been making a study of British Columbia Indians for the British Association, and also heads the expedition which the American Museum of Natural History sent out last spring, has returned to Victoria. Dr. Farrand, who is also engaged in the work of collecting information about the Indians, also returned. The two scientists have covered an immense territory, first going into the interior of the province and then coming out through to the northern coast. The work done in the interior was a continuation of the work which the British Association has been carrying on since 1877, while that on the coast was prosecuted in the interests of the American Museum of Natural History. The idea is to ascertain the origin of the coast Indians and whether any relationship exists between them and the natives of the Asiatic coast. A study will be made of the Indians from the Columbia River to Behring Strait; and of what is known of the traditions and customs of the natives of the two coasts, Dr. Boaz is convinced that they are related and the first Indians on this side of the Pacific came from Siberia.

THE total amount expended for pensions during the year ended July 30 last was $141,200,551, which is an increase of $1,747,761 over the previous year. Since 1865 the payments for pensions have aggregated $2,148,156,095.

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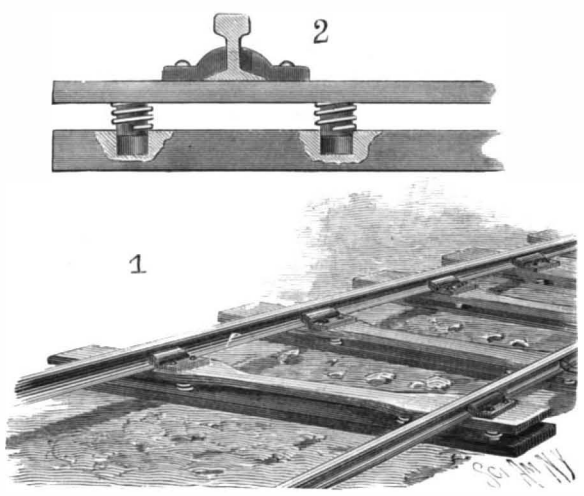
A SPRING-CUSHIONED METALLIC RAILROAD TIE.

A railroad tie designed to lessen the wear and tear of the rails and rolling stock is shown in the accompanying illustration, and has been patented by Stephen K. Miller, of Newtown, O., Fig. 1 representing the improvement as applied and Fig. 2 being a sectional view. The tie consists of a body and a top section, and in the top of the body of the tie, near each end, are grouped four holes or recesses, into which enter corresponding lugs or posts on the under face of the top section, a spring being coiled around each lug or post, and bearing upon the upper face of the body of the tie and the under face of the top section. The springs are normally strong enough to prevent the top section

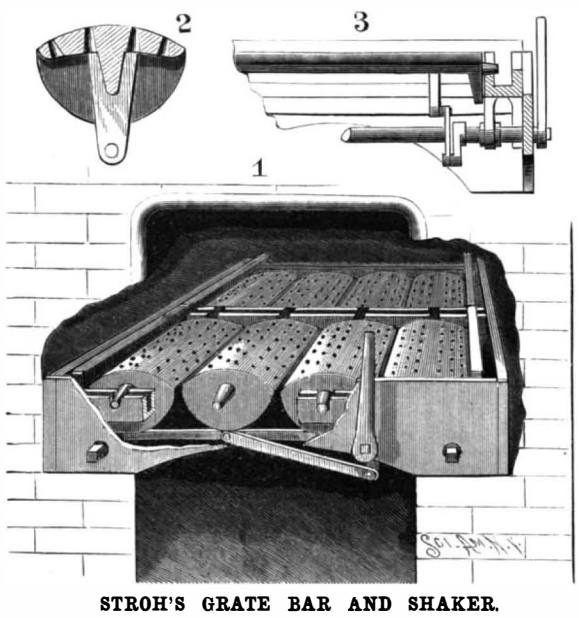


MILLER'S RAILROAD TIE.

being pressed downward by the weight of a moving train into contact with the bottom section, the track being thus practically spring-cushioned throughout its length. The rails are firmly held in place on these movable sections of the ties by the usual chairs or clamps.

A ROCKING GRATE BAR AND SHAKER.

In grate bars connected for rocking movement to agitate the bed of coals, the accompanying illustration represents an improvement recently patented by Abraham Stroh, of Freeland, Pa., the large view showing several connected grate bars, Fig. 2 being a sectional view of one grate bar and Fig. 3 a transverse sectional view of the grate-supporting frame. The bearing frame has inwardly extending ledges on which rest parallel carrier bars, in notches in which are supported journal studs at each end of the grate bars. The bodies of the grate bars are each stiffened by a longitudinal rib projecting from its lower surface, and at each side of the rib the grate bar is numerously perforated, the perforations being of the greatest diameter at their lower ends to facilitate the passage of ashes and prevent clogging. The pairs of carrier bars for each series of grate bars are held spaced apart by spacing bars, to prevent cramping contact, and on the lower side of each grate bar is a downwardly extending arm. All the arms in the grate bars of a series are pivotally attached to a



STROH'S GRATE BAR AND SHAKER.

connecting bar connected by a link with a rock arm on a shaft journaled in the bearing frame, the shaft being polygonal at its end to receive a handle lever, by which all the grate bars may be simultaneously rocked. By providing separate series of grate bars and independent shaking devices the fire may be cleaned in sections, and the disposition of material in the grate bars is designed to afford the greatest strength with the least weight.

IMPORTANT frescoes of the fourteenth and fifteenth centuries have been discovered under the plaster on the walls of the church San Domenico, at Riete, in Umbria. Among them is the coronation of St. Peter, martyr, Pinturicchio.

Rubber Substitutes.

Substitutes enter very largely into the compounding of rubber, because of certain distinct advantages which they possess, and which are not shared by coal tar or the simple mineral adulterants. They have not the vulcanizing effect of sulphur or the metallic oxides and sulphides. The chief value lies in cheapening the stock without disturbing its working qualities or impairing the texture, finish, or weight of the manufactured product. Their after effect on the life of the goods is, however, another matter.

The term "rubber substitute" may be broadly considered as including any substance possessing characteristics similar to those of unvulcanized rubber, and adapted to displace it in compounding. Ordinary reclaimed rubber, as well as the sulphurized oils, is included in this definition.

The reclaimed rubber of commerce is obtained by steaming or devulcanizing old rubber waste, generally shoes, freed more or less perfectly from fiber. Having originally contained some real caoutchouc, it is generally considered rubber of low grade rather than rubber substitute. Since its introduction its use has rapidly extended, until it is now a very essential factor in the ordinary and cheap lines of goods, and its presence is not entirely unknown even in the highest grades. As a substitute, it ranks first in merit and general use; the annual output in this country alone reaching thousands of tons.

As a substitute it is most available in goods where color or extreme lightness are not essentials. Being chemically inert, that is, free from any oxidizing tendency, it can be compounded with rubber in all proportions without injury to the new stock.

The sulphurized oil substitutes constitute a class by themselves, and are distinguished as brown or white, although chemically they are essentially very similar. Any of the readily oxidizable rejectable or drying oils combine freely, under proper conditions, with sulphur to form a more or less rubberlike mass. According to the selection of the oil and the mode of treatment, we get brown or white substitute. Such oils as linseed, rape, mustard and peanut are well adapted to make brown substitute. The process is a simple one, consisting in boiling any one of these oils or mixture of them in any proportion with flowers of sulphur. The operation may be carried on over a fire or by steam in a jacketed kettle. The proportions are generally about eighty per cent of oil and twenty per cent of sulphur. The reaction is complete in three or four hours at the heat of eighty pounds of steam (325° F.) It is well to boil the oil out of doors or in a strong draught of air, to carry off the noxious vapors. The mixture should be thoroughly stirred while cooking.

Mustard oil reacts quite promptly with sulphur, but gives a firmer product, and one that breaks rather shorter than that from the other oils named. It is best used in mixture with them. Linseed gives off the most disagreeable odor, and has no special advantage in point of quality of product.

The white variety of oil substitute is made by treating refined mustard, rape, castor, or cocoanut oils separately, or in mixture with sulphur chloride either in the cold or with moderate heat.

The light, porous variety may be made by mixing with the oils a small proportion of sodium bicarbonate, which, under the influence of the sulphur chloride, generates gas in sufficient quantity to render the whole mass very spongy.

The operation should take place in an earthen or lead-lined vessel, and the sulphur chloride be added slowly and stirred briskly into the oil.

The proportion of sulphur chloride to oil should be about one to eight and of soda to oil about one to twelve.

When the chemical action is over, the product is allowed to dry for a couple of days before use.

A solid, amber-colored substitute is made in the same way and proportions, omitting the sodium bicarbonate.

All operations involving the use of sulphur chloride should be conducted in a strong draught, and best in the open air, to avoid the evil effects of the vapors.

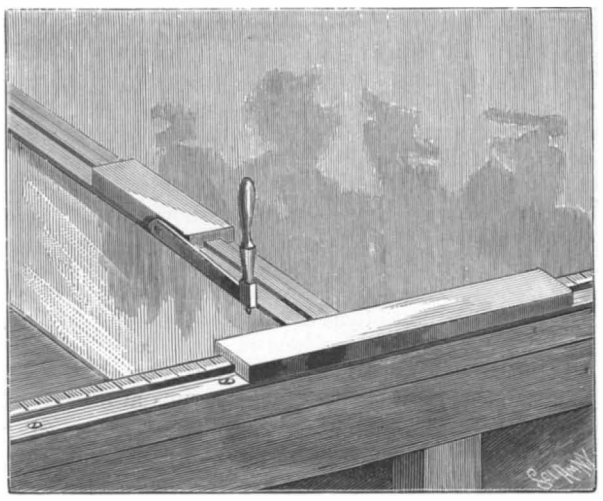
Chemically, the use of these sulphurized drying oils in rubber compounds is bad. They exert a marked influence in shortening the life of the goods, because by their active chemical nature they hasten the oxidation of the rubber present to the brittle resinous products which give evidence of their existence in the compound by its loss of elasticity, and by the hardening and cracking of the surface. There is little to be said for these oil substitutes from a chemical point of view. Their great practical value is entirely a matter of price, for they enable the manufacturer to cheapen the stock while maintaining the proper relative weight or specific gravity of the compound with reference to pure rubber.

The matter of specific gravity, or the ratio of the weight of any substance to that of an equal volume of some other substance taken as a standard, is a point of much importance. It governs the relation of pound price and piece price in rubber manufacture. Specific gravity and the percentage of ash in a rubber compound once gave an indication of the amount of rubber present, but since the extensive use of oil substitutes they have no value as specifications of quality.

The specific gravity of caoutchouc or pure unvulcanized rubber is 0·915. It will, therefore, float in water about like ice—that is, nearly submerged. The oil substitutes are slightly heavier; enough so to sink in water.—The India Rubber World, New York.

IMPROVED GLASS CUTTING APPLIANCES.

To facilitate the measuring and cutting of plate glass, the gage and appliances shown in the accompanying

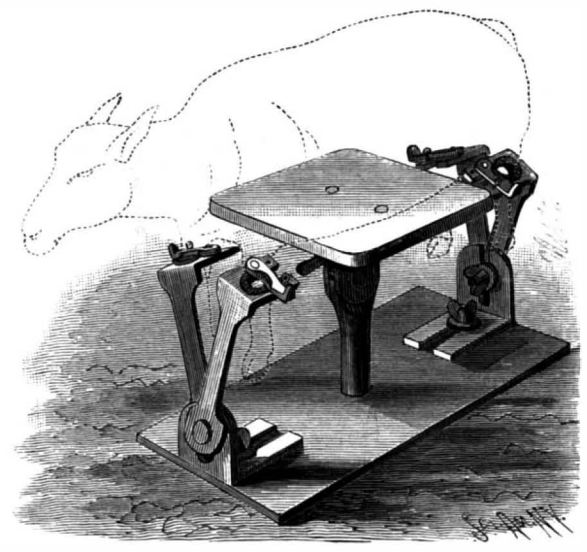


SEITER'S GLASS CUTTER.

illustration have been patented by John W. Seiter, of Harlan, Ia. A graduated rail is rigidly secured to a suitable bench, one side of the rail projecting upward to form a flange, and sliding on the rail is a carriage bar in whose under side is a rabbet groove in which the rail is received, the inner side portion of the carriage bar overhanging the inner side of the rail. The under side of the bar, which is flush with the bottom of the rail, has a dovetail recess in which the dovetail end of a guide bar is secured, the depth of the recess being such that the lower surface of the guide bar will be raised above the surface of the bench, and above the lower face of the overhanging portion of the carriage bar, so that the plate glass may be placed under the guide bar, to bear against the carriage bar. A rib on the upper side of the guide bar forms a rail on which slides a carriage block to which a glass-cutting blade of any desired form may be pivoted, the carriage bar being adjustable along the graduated rail, and taking with it the guide bar, which is adjusted on the glass plate to the desired size of glass to be cut.

AN ANIMAL HOLDING DEVICE.

To facilitate the proper and convenient holding of sheep while they are being sheared, the apparatus shown in the accompanying illustration has been devised and patented by John Ralston, of Slippery Rock, Pa. On its base plate stands a central stub shaft



RALSTON'S ANIMAL HOLDING DEVICE.

or post inclosed by a tubular column, to which is rigidly attached a vertical plate whose upper edge is ratcheted and curved in the arc of a circle, and two side plates are also pivotally connected with the central plate, and rigidly attached to the table. The table carries a spring pawl pressing against the ratchet teeth of the central plate, whereby the table may be turned to any axial position and given and retained in any desired inclination. At each end of the base plate are means for holding the front and hind legs of the sheep, consisting of angle plates which support fastening arms, each of which has a padded slot, in which the legs are locked in place by pivoted bars held in closed position by linch pins, the fastening arms being freely adjustable to regulate the position of the sheep.

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ELECTRIC CABS IN LONDON.

On Thursday, August 19, Mr. W. H. Preece inaugurated a service of electrical cabs which are to ply for hire in the streets of London in competition with the ordinary hackney carriages. Thirteen of these cabs are now ready for work, and a staff of drivers have been instructed in the use of them. The cabs will be let out by the proprietors, the London Electrical Cab Company, Limited, just at the same rates and in the same manner as the London cabs. The "cabbies" are, we are informed, quite enthusiastic about the new vehicle.

They are being taken out in parties on a special brake, and instructed in the management of the switches, steering gear, etc. In a short time twenty-five more cabs are to be added to the number now ready. The new vehicle resembles very closely a horseless and shaftless coupé. It is carried on four wooden solid rubber-tired wheels. There is ample space for the coachmen. The accommodation within is luxurious. The propelling machinery consists of a three horse power Johnson-Lundell motor, with double wound armature and fields, so that by the use of a suitable switch or controller a variety of speeds can be obtained.

The controller is arranged so as, on the first step, to connect on two armature windings and the two field windings of any series with a small starting resistance. This is not a running speed, but is only intended to start the motor into motion. On the second step the windings are still in series, but the resistance cut out; and with this arrangement the cab runs at a speed of about three miles an hour. The third step places the armatures in parallel, but leaves the fields in series; and with this arrangement the cab runs at about seven miles an hour. The fourth step places the field windings in parallel, and the cab runs nine miles an hour. It will thus be seen that three normal running speeds allow of the full energy of the current being utilized in the motor without any absorption in resistance, and the cab can thus "crawl," using only about the same number of watts per car mile as when running at full speed. In the reverse direction from the stop position the series parrallel controller on the first step short circuits the motor through the starting resistance, thereby gently braking the cab. On the second step backward the motor is completely short circuited, bringing the cab to a dead stop; and the third step backward reverses the connections between the armature and fields, all being in series, to enable the cab to be moved at the slowest speed backward. The whole of these movements are produced by the use of one lever, placed at the side of the driver's box. The driver has, besides, a powerful footbrake, which in coming into action brakes the circuit.

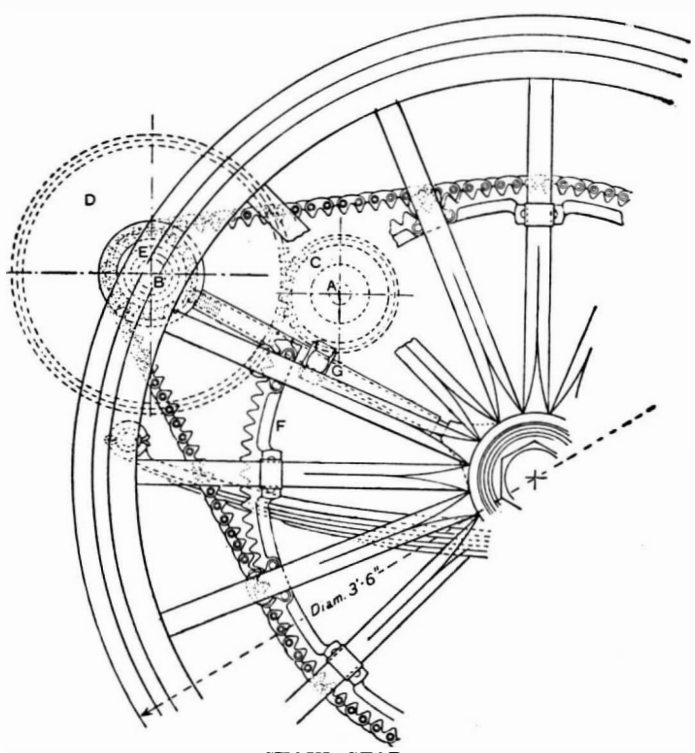
The current is supplied by 40 E. P. S. traction type cells, having a capacity of 170 ampère hours when discharged at a rate of 30 ampères. The cabs can thus travel between thirty and thirty-five miles per charge. It is intended, however, to have other electric supply stations besides that at Juxon Street, Lambeth, at other parts of London. The storage batteries are hung on springs underneath the vehicle. The manner of getting them into position is important; in the supply station there are two hydraulic lifts, one of very short stroke, the other long enough to raise its platform, which sinks level with the ground floor up to the charging gallery. The cab is first put over the smaller lift, and under it is run a small iron trolley; this trolley is then raised until the weight of the batteries, some 14 cwt. by the way, is taken. Four pins are removed and the electric connections broken. The lift is then lowered, and the trolley run on to the second lift, which raises it to the gallery, where it is run off and placed in position for recharging, the charged cells being taken down and attached to the cab by a reverse operation.

The driving power is transmitted from the motor to both of the rear wheels. For this purpose large driving rings are attached to the spokes, Hans Renold's latest laminated chain being used. It will be remembered that this is not a sprocket chain, but resembles very closely an ordinary leather link belt, except that the links are of steel, and terminated at the under side of each end under the pins in V-shaped pieces, which engage in similar V notches on the driving wheels. The "chain" can therefore play sideways, and the wear is more uniform on that account. Very little noise is made by this gearing, and that which would be made by the motor and the jack-in-box gear, which is arranged on the countershaft, and which is necessitated by the fact that both wheels are drivers, is deadened by being inclosed in a case thickly lined with felt.

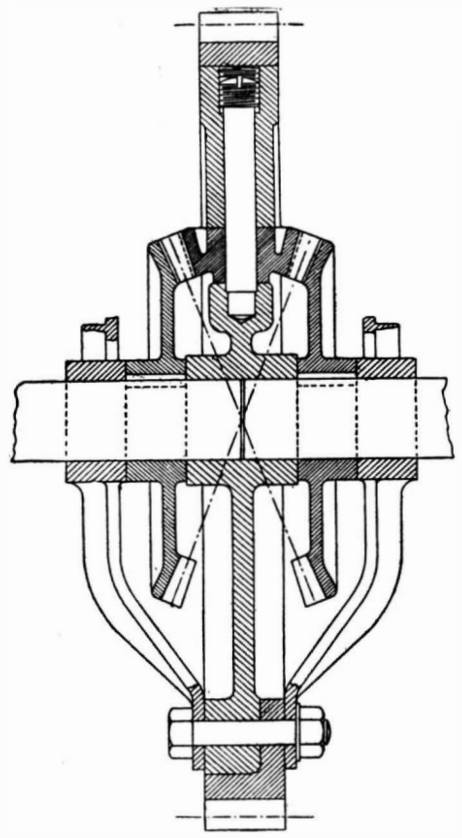
Steering is done by rotating the entire fore carriage, which turns on a ball-bearing racer, and is actuated by a hand wheel, as seen in the illustration.

The current for charging the accumulators at Juxon Street, Lambeth, is received from the London Electric Supply Corporation, at 3,400 volts, alternating with a periodicity of 83 per second. To convert this into a continuous current, two alternating motor generators have been provided, each one with an output of 75 kilowatts on the secondary side. These machines consist of a British Thomson-Houston alternator coupled on the same bedplate to a continuous current generator of the same make. The alternator is run up to the speed by the cells, which it is afterward to charge, put in step with the London Electric Supply Company's current, and the continuous current field then strengthened until the requisite volts pressure is obtained for charging the cells. The transformation from high pressure alternating to low pressure continuous current is thus effected without the use of any intermediate transformers, with an efficiency of about 86 per cent. The Shoreditch Vestry have also entered into a contract with the company for the supply of current at its second charging station, which will probably be in the City.

The engineers of the London Electrical Cab Company are of the opinion that, although up to the present time accumulator traction, as applied to tramcars, has not been a marked success, it will prove satisfactory in cabs, for the simple reason that the proportionate weight of accumulators to load is very much greater in cabs than in trams. The accumulator is thus not hard and uneconomically worked, but gives out its current at the most economical tension. This holds even at a variety of speeds, the regulator rendering it possible. Only when the very severest gradients have to be ascended is the battery to any extent, and then not severely, overtaxed. For our engravings we are indebted to the Engineer and the Electrician.



CHAIN GEAR.



SECTION OF DIFFERENTIAL GEAR.

A PUBLIC ELECTRIC CAB IN LONDON.

The Influence of Music.

The influence of music upon the respiration, the heart and the capillary circulation is the subject of a paper, by MM. A. Binet and J. Courtier, in the Revue Scientifique (February 27). Experiments were made upon a well-known musical composer, and the investigators endeavored to determine effects produced by musical sound alone, as distinct from those due to emotions aroused by pieces associated with dramatic incidents or words. Isolated notes, chords in unison, and discords were first tried. Both major chords struck in a lively manner and discords quickened the respiration, the latter more especially. Minor chords tended to retard respiration. When melodies were tried it was found that all, whether grave or gay, produced quickened respiration and increased action of the heart. The lively tunes produced the greatest acceleration. Where the sound was wholly uncomplicated by emotional ideas, as in single notes or chords, the heart's action was accelerated, but not in so marked a degree as when a melody either grave or gay was played. During operatic pieces, or those well known to the subject, the acceleration attained its maximum. The influence of music on the capillary circulation was tested by a plethysmograph attached to the right hand. The capillary tracings showed that a slight diminution of pulsation was usually produced by musical sounds, the effect being very small when sad melodies were played, but well marked when lively airs were played.

REMAINS of what seems to be a Roman basilica, with columns three feet in diameter have been found in tearing down a shop in the center of the city of Chester, England.

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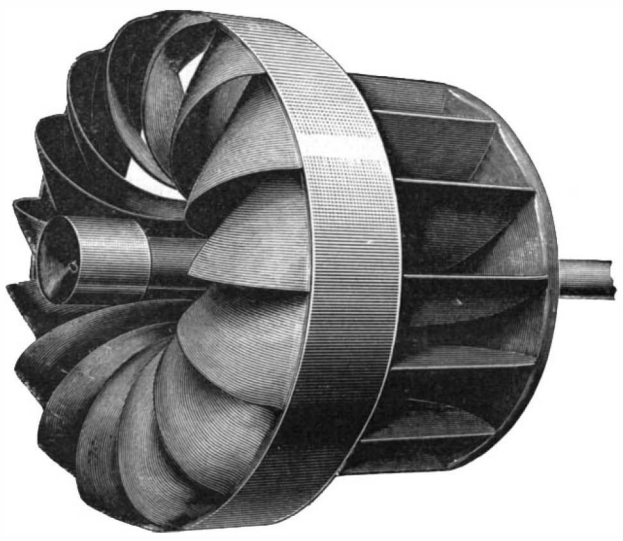
A NOTABLE PAIR OF HORIZONTAL TURBINES.

(Continued from first page.)

steel and the ends are closed by massive cast iron covers, the turbines and draught chest being thus entirely inclosed, as shown in the front page engraving. The great weight of the flume, turbines and contained water is carried by two pairs of double I-beams, 20 inches deep and 38 feet long, which extend the full length of the flume, a pair on each side. The load is transferred to these by bracket extensions of the end covers and by transverse I-beams on each side of the central draught tube.

The shaft in the wheels, which is made in two sections, is 10 inches diameter, 42 feet 2 inches long, and its weight is over five tons. The massive clamp coupling which connects these two sections of shafting in the center of the draught chest, shown in dotted lines in the accompanying diagram, weighs considerably more than a ton. Just outside the flume at each end are stands weighing 8,000 pounds, which carry the journal boxes for this shaft. The two turbines with their complete outfits weigh approximately 250,000 pounds.

The wheel case (see accompanying illustration), which contains a number of graduated chutes, and consists of an upper and lower plate connected by fenders or gate guards, is cast in one piece. The chutes are hinged at a point near the inside of the case, and as the gates are opened or closed the chutes move with them. This provides an evenly distributed flow of the water around the wheel, which is delivered in gradually expanding or contracting veins. The guards behind the gates relieve them from hydrostatic pressure, and the gates are easily opened or closed by means of a revolving ring and a series of levers which are operated by a segment and pinion. The hand wheels for controlling these gates are located at the front of the large flume. The case is closed by a dome or crown plate, which carries the ring, levers and segment for operating the gates.



THE WHEEL REMOVED FROM CASE.

VERTICAL SECTION OF CASE.

The wheel for this type of turbine was formerly made with steel buckets which were set in the mould and the rims cast to them. It was found, however, that wheels so constructed were deficient in strength for high heads. Sooner or later, the buckets became detached from the rims. The new method is to make the whole piece in one solid casting, formed by dry sand cores, and this system has been adopted in building the present 57 inch turbines. After the wheel was bored and fitted to its shaft, it was placed in the lathe, the rims were turned off, the shaft serving as the axis, and the whole piece was accurately balanced.

These turbines operate two 1000 horse power Westinghouse electric generators, coupled directly to each end of the shaft. They run at from 144 to 160 revolutions per minute, and the current is used for electrolytic refining. The varying speed of revolution is necessary in order to increase or diminish the current as conditions may require.

The power of these wheels is also utilized for driving an arc light dynamo and the two 50 horse power exciters for the large generators, the power being transmitted from wheel shaft to dynamo by means of a 20 inch double leather belt; and there still remains a surplus power in the wheels which is not being utilized at present.

It is estimated that if a pair of these 57 inch new American turbines of this design and capacity were placed in operation on the new water power at Niagara Falls under 140 feet head, they would develop 18,494 horse power, and would require a shaft 15 inches diameter to safely transmit the power, estimating the power to be taken off at each end of the shaft, as is the case at Great Falls, Montana.

Before shipping these wheels to Great Falls, the builders had them tested at the testing flume of the Holyoke Water Power Company, Holyoke, Mass., and both the right hand and left hand turbine showed an average efficiency from three-quarters to whole gate inclusive of 81¼ per cent, which is an excellent performance. In consequence of the turbines being required to stand the great strain due to 50 feet head, the buckets were necessarily made very thick. Had they been made of the ordinary thickness, the percentage of useful effect would have been increased to at least 83½ to 84 per cent. This was the judgment of a number of engineers who made an examination of the turbines. They were tested with the ordinary cylinder below the wheel, as all tests of this make of turbines have been made. Flaring draught tubes or diffusers would have increased the percentage. The wheels were guaranteed to show an average efficiency of 80 per cent from three-quarters to whole gate and develop 2,800 horse power under 40 feet head, and they exceeded the guarantee both in horse power and efficiency.

Information About Alaska.

The continued interest manifested by the public in everything connected with our great territory at the north, since the commencement of the gold mining fever on the Klondike, has led to the recent publication of a handbook on Alaska, by the Bureau of American Republics, at Washington, D. C. The book treats of the geography and topography of the country, its climate and agricultural resources, its forests and fisheries, and its mineral resources. The picture drawn is not a very agreeable one for the intending prospector. It is said that the country outside of the mountains is a great expanse of bog, and large and small lakes with thousands of channels between them, and it is claimed that the Yukon discharges a volume of water one-third greater than that which empties from the mouth of the Mississippi. Near its mouth one is most struck with "the mournful, desolate appearance of the country, which is scarcely above the level of the tide, and covered with a monotonous cloak of scrubby willows and rank grasses. For hundreds of miles up, through an intricate labyrinth of tides, blind and misleading channels, sloughs and swamps, there is to be seen the same dreary, desolate region. It is watered here, there and everywhere, and impresses one with the idea of a vast inland sea as far up as 700 or 800 miles, where there are many points at which the river spans a breadth of twenty miles from shore to shore. It seems as though the land drained by the river on either side were a sponge into which all rain and moisture from the heavens and melting snow were absorbed, never finding their release by evaporation, but conserved to drain, by myriads of rivulets, the great watery highway of the Yukon, which is formed by the junction of the Lewis and the Pelly Rivers. During the brief summer the whole population flocks to the river, attracted by the myriads of salmon, the banks being lined with camps of fishermen, who build their basket traps far out into the eddies and bends of the stream, and lay up their store of dried fish for the long Arctic winter. To fully appreciate how much moisture in the form of fog and rain settles upon the land, one can do no better than take a walk through one of the narrow valleys to the summit of a lofty peak. Stepping upon what appeared in the distance to be a firm greensward, the venturesome tourist will sink waist deep in a sinking, tremulous bog."

As to the climate, a series of six months' observations on the Yukon, not far from the present gold discoveries, showed that the daily mean temperature, in 1889-90, fell and remained below the freezing point from November 4 to April 21, the lowest temperatures being 59° F. below zero in January and 55° F. below in February. Snow fell about one-third of the days in winter, and snowstorms of great severity may occur in any month from September to May. In June the sun rises at about 3 A. M. and sets at 10:30 P. M., giving more than twenty hours of daylight, and diffuse twilight the remainder of the time. The mean summer temperature rises to between 60° and 70° F., and in the vast network of slough and swamp, indescribably numerous clouds of mosquitoes are bred, which cause the greatest misery and annoyance to the explorer.

Of the mineral resources of the country it appears, from a report made to the United States Geological Survey by Prof. Spurr, that not only gold, but silver, copper, and lead are found in Alaska, the Yukon districts lying in a broad belt of gold-producing rocks, having a considerable width and extending in a general east and west direction for several hundred miles. Throughout this belt occur quartz veins which carry gold, but so far as yet found out, the ore is of low grade, and a large proportion of the veins have been so broken by movements in the rocks that they cannot be followed. For this reason, the mines in the bed rock cannot be worked, except on a large scale with improved machinery, and even such operations are impossible until the general conditions of the country in reference to transportation and supplies are improved. Through the gold-bearing rocks the streams have cut deep gullies and canyons, and in their beds the gold which was contained in the rocks which have been worn away is concentrated, so that from a large amount of very low grade rock there may be found in places a gravel sufficiently rich in gold to repay washing. All the mining which is done in this country, therefore, consists in the washing out of these gravels. In each gulch, prospectors are at liberty to stake out claims not already taken. In prospecting, the elementary method of panning is used to discover the presence of gold in gravel, but after a claim is staked and systematic work begun, long sluice boxes are built of boards, the miners being obliged to fell the trees themselves and saw out the lumber with whipsaws, a very laborious kind of work. The depth of gravel in the bottom of the gulches varies from a foot up to 20 or 30 feet, and when it is deeper than the latter figure, it cannot be worked. The upper part of the gravel is barren, and the pay dirt lies directly upon the rock beneath, and is generally very thin. To get at this pay dirt all the upper gravel must be shoveled off, and this preliminary work often requires an entire season, even in a very small claim. When the gravel is deeper than a certain amount, say 10 feet, the task of removing it becomes formidable. In this case, the pay dirt can sometimes be got at in the winter season, when the gravel is frozen hard, by sinking shafts through the gravel and drifting along the pay dirt.

Prospecting is very difficult owing to the character of the surface, the general formation being soft, the hills having been worn smooth by glacial action, which left a layer of drift over the whole country to a depth of from 5 to 15 ft. This is frozen the whole year, with the exception of a few inches on the surface. After a creek has been prospected, the glacial drift must be removed. The trees and roots are taken away and a stream of water turned on, which, with the help of the sun, in time bares the pay streak. The course of the water is then turned along the hillside, a dam built and sluice boxes erected. These are made with corrugated bottoms, which catch and retain the gold. They are given a grade regulated by the coarseness of the gold; if the gold is fine, the grade is slight; if coarse, a greater pitch can be given, which is preferable, as more dirt can be handled. The lack of water in these gulches proves a great hindrance in many cases. The seasons are dry, and only the glacial drip of the hills can be depended upon. A method lately adopted by which mining can be done in winter has proved profitable, besides doing away with the long period of idleness. This is called burning, and is done by drifting, melting away the frost by fire and taking out only the pay dirt, leaving the glacial drift and surface intact. The pay dirt thus removed is easily washed in the spring when water is plenty.

Curious Obstruction to Pile Driving.

After the great Boston fire, according to the Shoe and Leather Reporter, the clearers and the cleaners dumped tons of burned, sodden, acid-eaten leather at the foot of Summer Street. It has all been found. Deep down below dirt and stone it has remained ever since, solidifying more and more each year by its own weight and added pressure from the top. The pile drivers who were at work on the foundations of the new union station were the first to locate the leather beds. When the pile struck this mass, it stopped. No amount of hammering could budge it an inch. The pile emerged from the encounter with its head battered to pieces. The Italian workmen dug down to the mass and hacked at it with pick and shovel, but could not even scratch it. They tried adzes, axes and crowbars on it, but could not dent it. They tried to blow it up with dynamite, but the blast caromed around it. Finally the steam derricks managed to pull the stuff out of the mud.

THE horse car lines at Mayence, Germany, are to be replaced within a short time by a system of trolleys.—Uhland's Wochenschrift.

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FALL OF AN ELEVATOR AT THE TRACT SOCIETY BUILDING, NEW YORK.

The Tract Society building, New York, was recently the scene of a painful accident, in which one of the elevators fell from the upper stories to the bottom of the shaft, killing the engineer and the elevator boy. The accident occurred late in the evening, and, fortunately, when the rush of the day's business was over. The fact that the collapse happened in a modern and first-class city building, and that the apparatus which failed was put in by two of the leading and most successful makers of elevator machinery, gives special interest to the investigation which is now being made, the results of which will be given in a later issue. Briefly stated, the facts of the accident are as follows:

For some reason, not yet ascertained, the safety clutches, which prevent the too rapid ascent or descent of the car, were thrown in when the car was at the first or second floor, locking it fast. The engineer was sent for, and after he had released the clutch, he ascended with the elevator boy. The car was seen to pass the seventeenth floor, and shortly after it broke loose and fell the whole depth of the shaft. An investigation of the wreckage showed that the car had evidently struck the overhead framing of the elevator shaft; that the eight half inch hoisting cables had been broken off abruptly at the same point, and that the safety clutches had failed to grip the vertical guide bars which extend down each side of the shaft.

The two questions which are being asked are, first: What caused the breaking of the eight hoisting cables, any one of which could ordinarily have held the weight of the car? and, second, Why did the safety clutches fail to act?

In answer to the second question, it is stated that, on examining the wreckage, it was found that a bar, which the engineer had used to unscrew the capstan head, which releases the clutches, had been left in place and had jammed the apparatus so that it could not be closed.

The safety clutches are of the well-known type made by the Otis Elevator Company. They are operated by a centrifugal governor, which is attached to the beams at the top of the elevator shaft. The governor is driven by an endless wire rope, which passes over the governor sheave at the top of the shaft and under another sheave at the bottom of the shaft. One end of a short length of rope is attached to this rope at the level of the bottom of the car, and passes under the car to a drum on the clutch mechanism. The governor rope is thus made to travel at the same speed as the car. The governor is set for a certain speed, and if the car exceeds this speed, the governor will rise, and, by means of connecting levers, will close a pair of eccentric clutches, which instantly grip the governor rope and hold it stationary. The car being in motion and the rope stationary, the short connecting splice which runs to the clutch drum beneath the car is unwound, causing the drum to rotate. Two threaded horizontal bars pass axially into the ends of the drum, one having a right and the other a left hand thread. The unwinding forces these bars out to the sides of the car, where they are connected by toggle joints with powerful nippers or pincers, which take hold of the steel guides on each side of the car with an extremely powerful grip. Even when the guides are freely greased, if a car weighing six thousand pounds is cut loose—as was recently done in experimental tests at the works of the Otis Company—it will be almost instantly arrested. In addition to the automatic arrangement, there is also a hand rope by which the elevator boy can set the clutches independently. To enable the car to be released after the clutch has been thrown in, a capstan collar is provided on the drum shaft. This can be reached by raising a trap door in the floor of the car. On the present occasion it is supposed that the engineer used a short bar as a lever to turn over the capstan, and that, after winding up the drum sufficiently to release the clutches, he left the bar in the capstan. If so, it was this that cost him his life, for when the car fell, although the governor closed the eccentric clutches and the rope pulled the drum around as far as it would go, the latter was prevented by the bar from turning sufficiently to close the grips. It is said that the bar was found jammed over tightly against the edge of the trap door in a way that showed what a powerful pull the governor rope had exerted.

It is considered that, had the engineer withdrawn the bar, the car would never have fallen. At the same time the occurrence should be received by the company as a valuable suggestion to rearrange the releasing mechanism so that even in unskilled hands a recurrence of this form of accident will not be possible.

To determine the cause of the failure in the elevator mechanism is more difficult. Like the safety clutches, the plant, which is of the hydraulic type, is of a well tried and approved pattern and was put in by one of the best known makers in the country. Hydraulic elevators may be divided into five distinct groups, the system under discussion belonging to the fifth class:

1. Hydraulic systems which take their pressure direct from the street water mains.

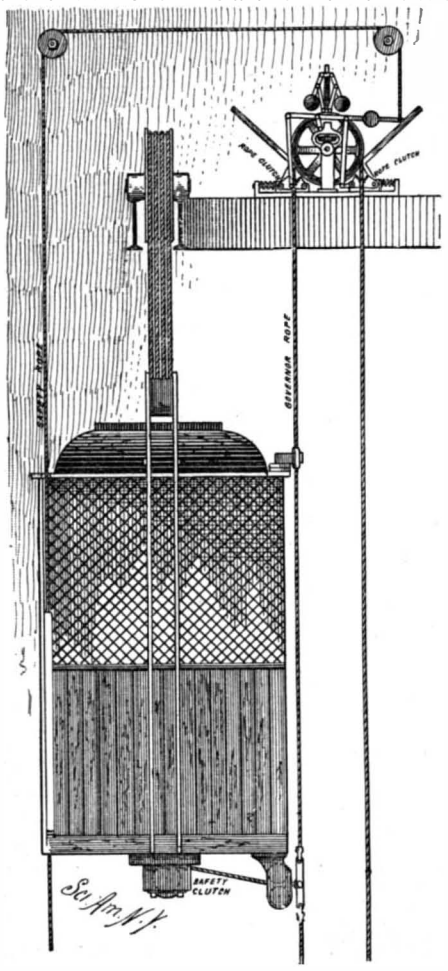
2. Those which derive their pressure from an open gravity tank on the roof.

3. Those which use a closed roof tank, where the pressure is due to the hydraulic head, plus the pressure of the pumps.

4. Those which use a pressure tank on or near the level of the bottom of the elevator machines.

5. Those which obtain their pressure from direct connected steam cylinders or from weighted accumulators.

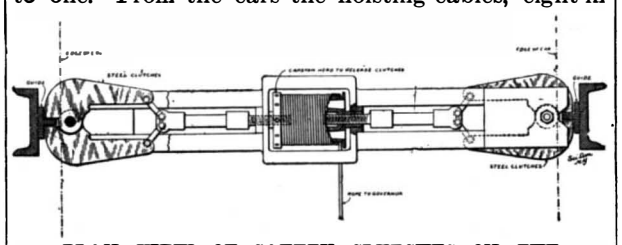
The above distinctions relate to the methods of furnishing the needed head or pressure. The elevator machines proper may be of the horizontal or vertical type and are of either the "piston" or "plunger" variety, the former consisting of pistons working in bored cylinders and the latter of plungers or rams working through stuffing boxes in cylinders that may or may not be bored to fit the plunger.



TRACT SOCIETY ELEVATOR, SHOWING GOVERNOR AND ROPES.

The elevators in the American Tract Society building are of the plunger type and pressure is maintained upon the elevators and the pumps are controlled by weighted accumulators. For the regular service of the elevators the water is supplied by a Crane high-duty, cross-compound, crank pump. There is also provided as a relay to the main pumps a powerful duplex pump, and there is also a smaller duplex pump for night and Sunday service. The main pumps deliver water against an accumulator pressure of 250 pounds to the square inch, and the pumps are automatically governed by the rise and fall of the accumulator.

The plunger cylinders extend half way up the shafts, the plunger being geared to the cars in the ratio of two to one. From the cars the hoisting cables, eight in number, pass over a sheave at the top of the shaft, then down below a sheave at the head of the plunger and are finally carried up and fastened to the overhead beams. The car is drawn up by the pull of the dead weight of the plunger. When an ascent is to be made the discharge valve is opened, releasing the water from the cylinder and allowing the plunger to descend. To lower the car, water is admitted to the cylinder, so as to raise the plunger. The shipper rope leads from the car to a pilot valve, which in turn acts upon the main valve, its action being similar to the floating lever in common use in steam engineering. This guards against a too sudden admission or exit of the water; for, however suddenly the shipper may be pulled, the main valves will only open by degrees, thus insuring a gradual starting or stopping of the car. The water, under the accumulator pressure, enters the cylinder through a check valve, whose office is, in case of the bursting of any part of the pipe system, to maintain the water in the cylinders and hold the cars stationary at the point at which the accident occurred. Such in brief is the hydraulic system as carried out at this building. The safety appliances are worked out on the well known lines adopted by the Crane Company, and the fact that they have hitherto given good satisfaction all over the country makes the present deplorable accident the more puzzling, and will lend special interest to the pending inquiry.



PLAN VIEW OF SAFETY CLUTCHES ON THE ELEVATOR CAR.

The Wellman Polar Expedition.

It was recently announced in the New York Herald that Mr. Walter Wellman was to be the leader of an expedition into the polar region. Three years ago Mr. Wellman was the head of an expedition which penetrated far into the ice at the north of Spitzbergen. The new expedition will start north some time next June, taking the Franz Josef Land route. Mr. Wellman has just returned from Europe, and held a long conference with Nansen concerning his plan, which Nansen approved with warm terms. Mr. Wellman says:

"My plan is very simple. We shall establish a supply station at Cape Flora, which has just been abandoned by Jackson, the English explorer, who returned without going as far north as Nansen did. Next autumn we expect to throw out a second supply station, two or perhaps three degrees further north, or within seven or eight degrees of the pole. There we shall winter. The following spring, as soon as there is light enough to travel by, we shall set out with six men, sixty or seventy dogs and sledges, determined to make the best possible use of the favorable season. The favorable season for work in that region is while the cold is still great, say at temperatures from sixty to fifteen below zero. Then the surface is hard and sledging at its best. In June the power of the summer sun produces slush and renders travel difficult, if not quite impossible.

"Therefore, we shall have from one hundred to one hundred and ten days in which to make our effort. Actually, all attempts to reach the north pole nowadays are dashes. Dr. Nansen made his dash from the Fram. Lieutenant Peary proposes to make a dash from the north of Greenland.

"Dr. Nansen believes, if he had had a base of supplies to fall back upon and a large number of dogs, he coule have reached the pole. He says it can be done in the way I propose, and I am naturally eager to have a try at it, and, if possible, to plant the American flag at the spot where there is no other direction than south.

"I am well aware that many persons think nothing practical is to be gained by reaching the pole. It chances that I am an enthusiast in this field, and I ask neither public subscriptions nor universal consent. My party will be a mixed one as to nationalities, with a few American scientific men and the others Norwegians."

Possibilities of Trade with Central Africa.

We are in receipt of a letter from Mr. J. H. Camp, of Lima, Ohio, bearing upon the question of the development of our trade with Central Africa. Mr. Camp speaks with authority, having spent seven years at Congo, and he states that the inhabitants of Central Africa are always ready to pay high prices for manufactured goods, provided they can be sure of obtaining a really durable article. At present there is a great demand for all classes of building material and household goods. There is a demand for all classes of textile goods, from calicoes to heavy blankets, and the superior class of tools made in the United States, including carpenter's tools and American axes, would sell readily among a people who are endeavoring to climb to the level of civilization. In exchange we would receive ivory, gold, precious stones, fine timbers, rubber, etc.

In conclusion our correspondent writes: "I may say that, after a thorough search over that great and rich equatorial country, I find that we are the only country of any great importance which has not taken steps toward permanent representation there. A set of consuls, properly located, would bring millions of dollars annually to our manufacturers, and keep thousands of idle operatives busy. I trust that before long our national association of manufacturers may be able to aid in opening this great and new country to our commerce, and I am sure that our people would be greatly surprised at the results which would speedily follow."

DR. H. B. GUPPY, English scientist, has just returned to Napoope, Hawaii, after spending twenty-three days alone on the summit of Mauna Loa, the famous volcanic mountain, at an elevation of 13,000 feet above the sea level. During this time he lived principally on rice, bread and coffee. He used melted snow to furnish the water. Dr. Guppy lost considerable weight, but is none the worse for his trip. He made many explorations on the crater, in addition to collecting such flora and fauna as could be found upon it. The crater was found to be seven miles in circumference. It was generally filled with steam during the doctor's stay on the mountain. One day a section of rock measuring 300 by 1,200 feet slipped into the crater, and the landslide continued for seven hours.

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THE HEMET IRRIGATING DAM, SOUTHERN CALIFORNIA.

A very remarkable undertaking has just been concluded in Southern California in the completion of the great Hemet dam, in Riverside County. In height it is second only to the Crystal Lake dam of the Spring Valley Water Works, near San Francisco.

Riverside is one of the most newly formed of Southern California counties, and in natural advantages of soil, climate, and productiveness, it is surpassed by none. With irrigation the growth of all temperate and some tropical plants is amazing.

The rainfall of the locality is below the average of Southern California, if anything, and is unevenly distributed, falling almost entirely in the winter months and early spring; but the mountains, which rise to an altitude of over 10,000 feet, afford storehouses of snow, which, melting during the hot season, affords an ever flowing stream of the purest water, of volume sufficient to irrigate all the productive lands of the surrounding country. The slopes of Mounts San Jacinto and Grayback, the former 10,987 feet in altitude and covered with snow the greater part of the year, provide an immense watershed whose outlet is the San Jacinto River, of which South Fork, flowing through Hemet Valley, is the largest tributary. The exact data for the whole district is wanting; but the area of the watershed of the tributary is estimated at 150 square miles.

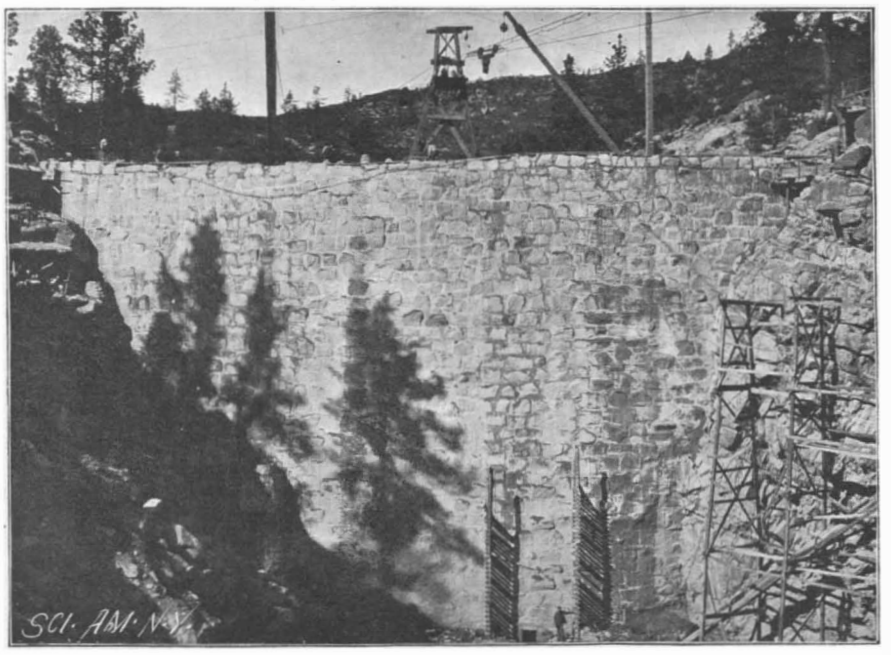
The outlet to Hemet Valley is a narrow cañon, with sides of granite, through which the stream plunges for nine miles, making a total descent, in that distance, of 2,000 feet. The altitude of the dam is 4,300 feet, and the climate at this point frosty and the country barren.

THE AQUEDUCT—IRRIGATED LANDS IN THE VALLEY BELOW.

The project of utilizing the water at this point was first broached in 1886, and plans were drawn for an impossible dam, four feet in thickness from top to bottom and curved, the convex face being upstream. It was to be constructed of cut stone laid in cement and it was to have the shortest possible radius. This plan was abandoned, and on the reorganization of the original company it was decided to first utilize the waters of the living stream to their fullest extent, and to conduct them to a tract of 7,000 acres of valley land owned by the company and over which it was proposed to distribute the water in pipes.

For this purpose a 13 inch pipe line was laid at the junction of Strawberry and South forks, and conducted 3½ miles down the cañon to the lands. The storage dam, though contemplated, was deferred for some years on account of financial reasons, until it was found that persons hesitated about acquiring lands which were supplied through a source that was regarded as a temporary expedient. On this account a storage reservoir was demanded, and work on a dam was inaugurated on the 6th of January, 1892, and carried on until floods and inclement weather compelled a suspension of construction for several months. At this time the dam had reached the 45 foot contour. Work was again resumed in 1893, and carried on without cessation until the dam had reached a height of 107 feet, but again floods interrupted, and it was not until the fall of 1895 that work was resumed, and continued with occasional interruptions until a height of 122·5 feet above the creek bed, or 135·5 feet above the lowest foundation was reached, and at this level it remains for the present, though ultimately the height will be increased to 160 feet. The site of the dam seemed specially calculated for a masonry structure because of the excellence of the bed rock foundation. There was abundance of good granite and sand right at hand, and the cañon itself was very confined.

A rock fill dam was first considered, but as the side walls of the cañon were no higher than the maximum of the height of the dam proposed, most of the rock would have had to be hoisted and transported from quarries above and below. Moreover, the volume of material to be handled would have been so much greater than for a masonry dam that there was no apparent economy in such a structure. The site chosen was inaccessible, and an expensive road with heavy grades had to be constructed, involving very great expense. The stripping of the foundations occupied several months, and a cableway was utilized for dumping water below the dam site. A "pot hole" encountered directly below the base of the dam was excavated, and several weeks were thus employed. This was filled with bowlders and gravel lightly rammed, and might have been built over with perfect safety, but it was determined to take no chances. A counter trench of irregular depth and width was cut in the rock on either side from bottom to top, as an anchorage for the masonry. Cement had to be hauled from Hemet Station, a distance of twenty-three miles and with an ascent of 3,200 feet, at a cost of $1 per barrel. A sawmill for the cutting of timber was one of the accessories, and over 1,500,000 feet were thus provided. The dam is 100 feet thick at the base and has a batter of one in ten on the water face and five in ten on the lower side. Its present crest is 260 feet long. The length at the bottom is but 40 feet. It was carried up with full profile to the height of 110 feet above base, where it is 30 feet in thickness. Here an offset of 18 feet was made and the wall reduced to a thickness of 12 feet. At the top it is 10 feet thick.

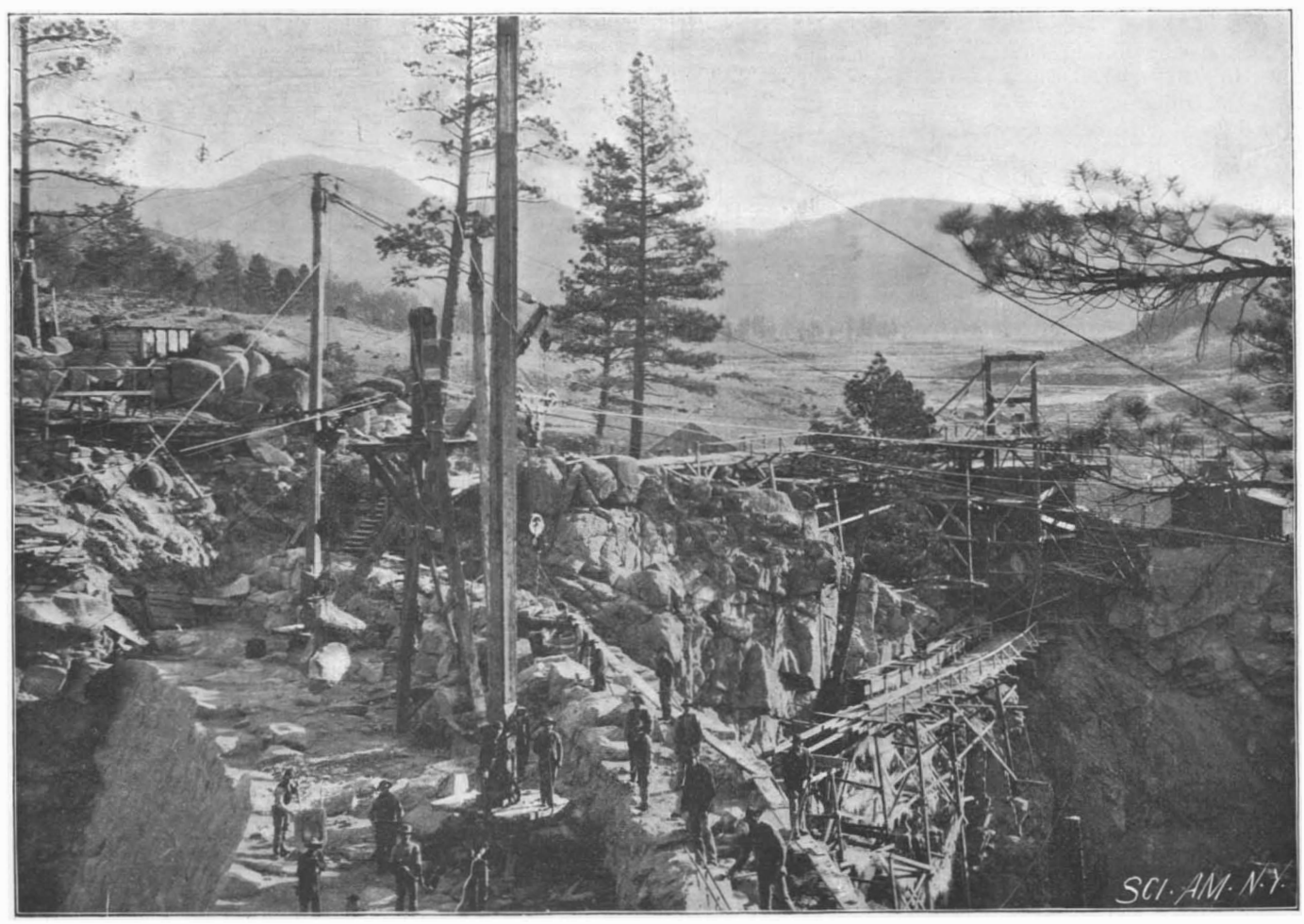


VIEW OF THE DAM FROM DOWN STREAM HEIGHT 110 FEET.

The dam is arched up stream, with a radius of 225·4 feet at the upper face on the 150 feet contour, and it is built of uncoursed rough granite rubble laid in Portland cement concrete throughout the body of the work, the faces for 3 to 4 feet in thickness being laid in cement mortar with large stones especially selected for true faces and beds. None of the stones are cut, although the facing stones were roughly scabbled. All the stones were washed clean before leaving the quarry with jets of water through a hose at considerable pressure. This washing was usually done after the stones were chained and before they were hoisted above reach.

The total cubic contents of the dam are 31,105 cubic yards, and 20,000 barrels of cement were used, which cost about $5 per barrel on the ground.

The stone was all quarried within 400 feet of the dam and was hoisted and conveyed to the wall by two cableways, each about 800 feet long, and the cable being 1½ inches in diameter. Two derricks, operated by a 36 inch Pelton wheel, one at each end of the dam, were placed so as to receive and deposit the loads directly from the cable and swing them into position. The concrete used to embed the blocks of stone was mixed in the proportion of one cement, three of sand and six of broken stone, crushed so as to pass through a mesh of 2½ inches. The stones were placed not less than 6 inches apart and the space filled with smaller stone, all well rammed into place with iron rammers.



THE HEMET DAM DURING CONSTRUCTION, SHOWING THE ROCK CRUSHER. TRAMWAY AND THE DISTANT VALLEY, NOW THE BED OF THE RESERVOIR.

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A bedding of concrete 3 inches or more in thickness was made for each of the large stones. The use of cement enabled unskilled laborers to perform much of the work. Stone masons were only employed on the facings. Wages were $1.75 for laborers; stone masons were paid from $3 to $3.50 per day. The total cost was somewhat below $200,000.

The capacity of the reservoir created by this dam is 10,500 acre feet, equal to 3,430,000,000 gallons of water. At the ultimate height, 160 feet, the water inclosed would be fully three times greater. At ordinary requirements this would irrigate 15,000 acres.

The above particulars of the enterprise are from a paper read before the Technical Society of San Francisco by James E. Schuyler, C.E.

The Knapp Roller Boat Launched.

The roller steamer designed by Lawyer Knapp, of Napanee, was successfully launched at Toronto, September 8. The vessel is cylindrical, 110 feet long and 25 feet in diameter, and has a 60 horse power engine at each end. It is made of three-eighths inch boiler plate, and has an inner and outer casing with watertight space between them. The engines are expected to drive the outer cylinder rapidly around and make it roll over the water, the inventor looking for a speed of at least forty miles an hour.

A FEW NEW INVENTIONS.

We give a group of illustrations of patented inventions taken from patents recently issued from the United States Patent Office.

The selection has not been made with the view of showing any special class of inventions, but merely to show the great and diversified activity that prevails among inventors.

GAS EXHAUSTING APPARATUS.—This exhausting apparatus is designed for use in connection with the exhausting of the bulbs of incandescent electric lamps.

It has many features in common with other mercurial pumps, also many that are novel. It quickly produces a very high vacuum by simply raising and lowering the vessel of mercury.

Each manipulation of the vessel, g^3, up and down will exhaust from the lamp bulbs and the ring, e^2, ninety-nine one-hundredths of what remains of the gas at the beginning of each manipulation, leaving only one one-hundredth behind. Thus, if the first manipulation, when the air was driven out from the vessel, k^3, be not considered, the remaining quantity of gas in the bulbs and ring, e^2, after the first effective manipulation of the vessel, g^3, in the manner described will be one one-hundredth of the original quantity of gas. After the second manipulation the residue will be one one-hundredth of what remained after the first manipulation, or one ten-thousandth of the original quantity of gas, and so on until, after the tenth manipulation, the residual gas in the bulbs and ring, e^2, will be one-quintillionth of said original quantity.

J. W. T. Olan, of New York, is the inventor of this apparatus.

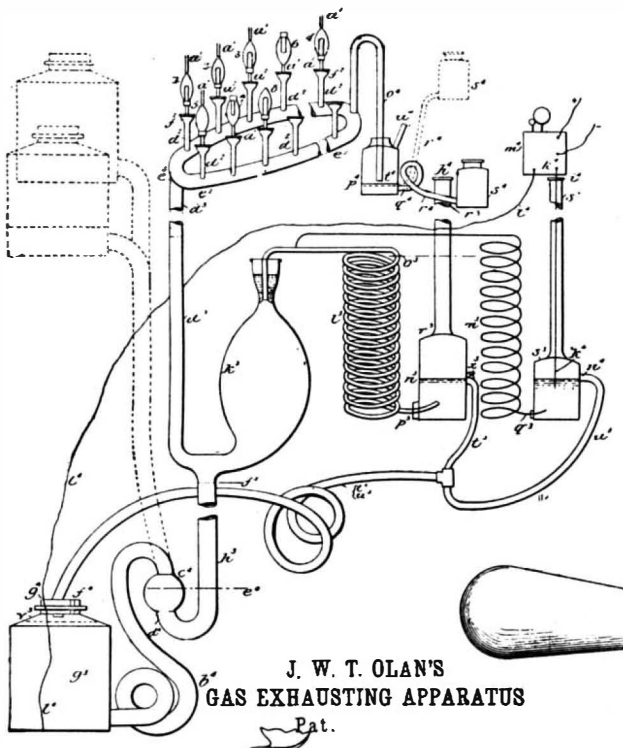
TILTING SADDLE BAR AND SEAT POST FOR BICYCLES.—The object of this invention, which has been patented by Charles Wooster, of New York City, is to secure an easy, adjustable saddle which may be rendered adaptable to any rider, or to the same rider under different circumstances.

The seat bar is jointed to the saddle post and provided with a serrated sector which is capable of being clamped in any desired position by a follower placed in the side of the seat post and pressed by a lever screw.

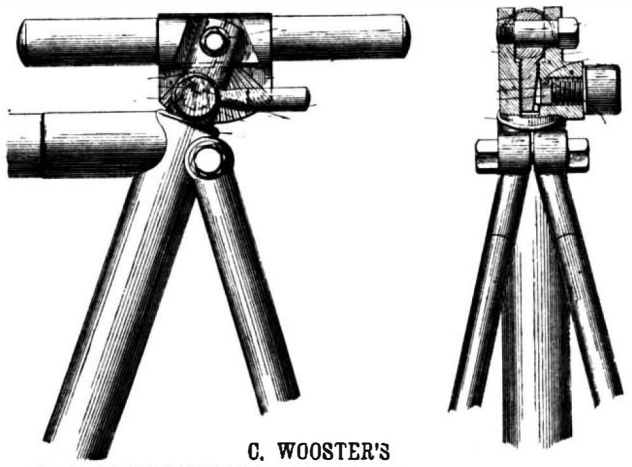
This device permits of adapting the saddle to different persons, and it permits the same rider to vary his position from time to time.

COMBINED STEAM ENGINE AND BOILER.—We give a sectional view of a new form of steam engine patented by W. Schmidt, of Ballenstadt, Germany.

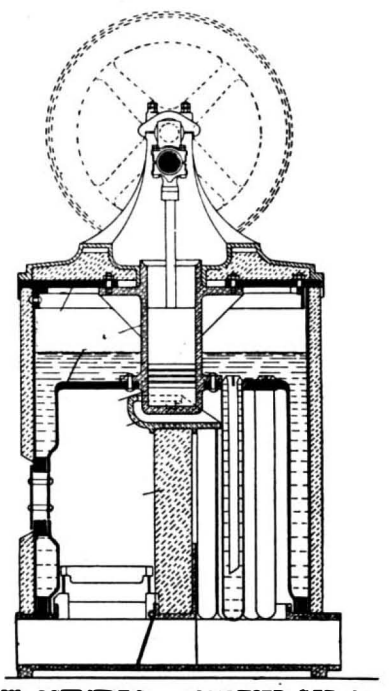
This invention relates to steam boilers and engines in which the cylinder of the engine is either partly or wholly arranged in the boiler. There are combined steam engines and boilers in which the cylinder is ar-



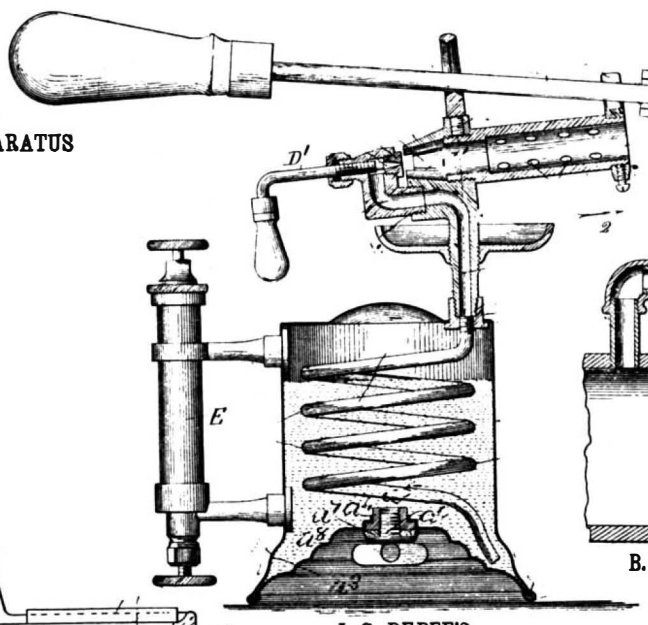
J. W. T. OLAN'S GAS EXHAUSTING APPARATUS



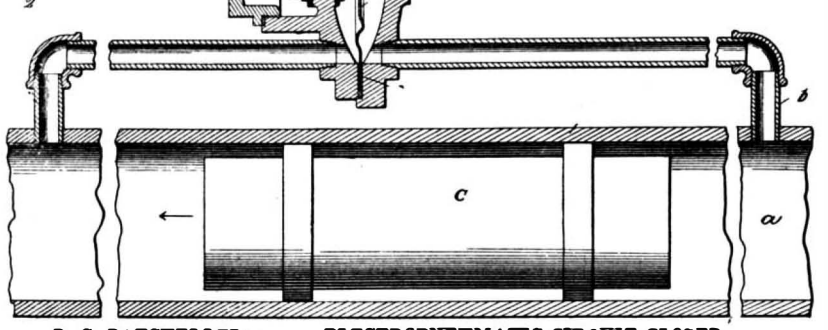
C. WOOSTER'S TILTING SADDLE BAR AND SEAT POST FOR BICYCLES.



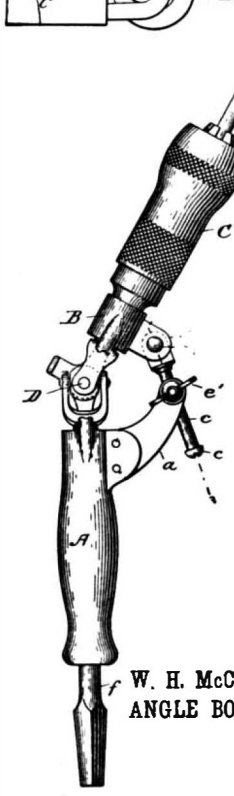
W. SCHMIDT'S COMBINED STEAM ENGINE AND STEAM GENERATOR.



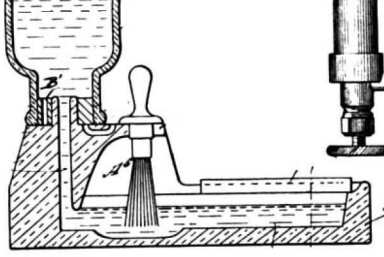
J. C. DUPEE'S BRAZING APPARATUS.



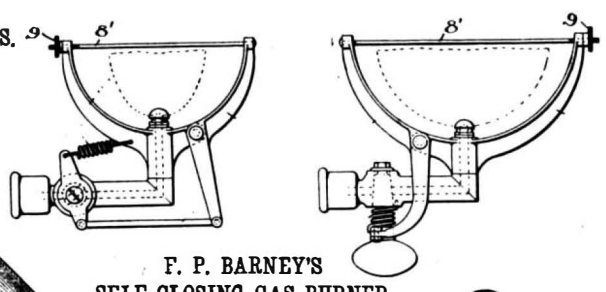
B. C. BATCHELLER'S ELECTROPNEUMATIC CIRCUIT CLOSER.



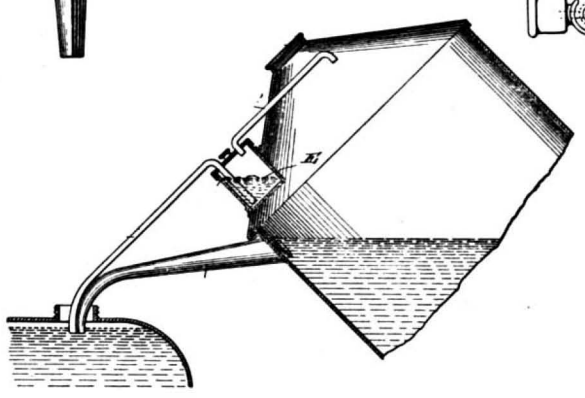
W. H. McCOY'S ANGLE BORER.



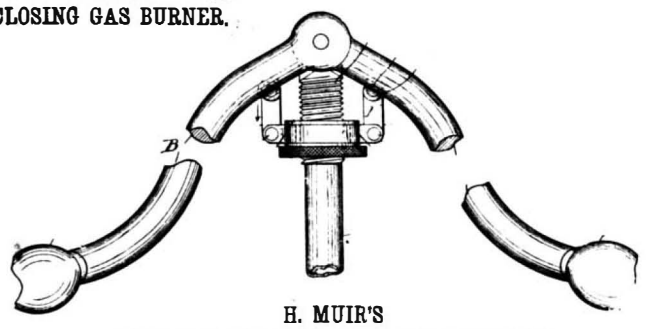
W. H. BURLAND'S GUMMING APPARATUS.



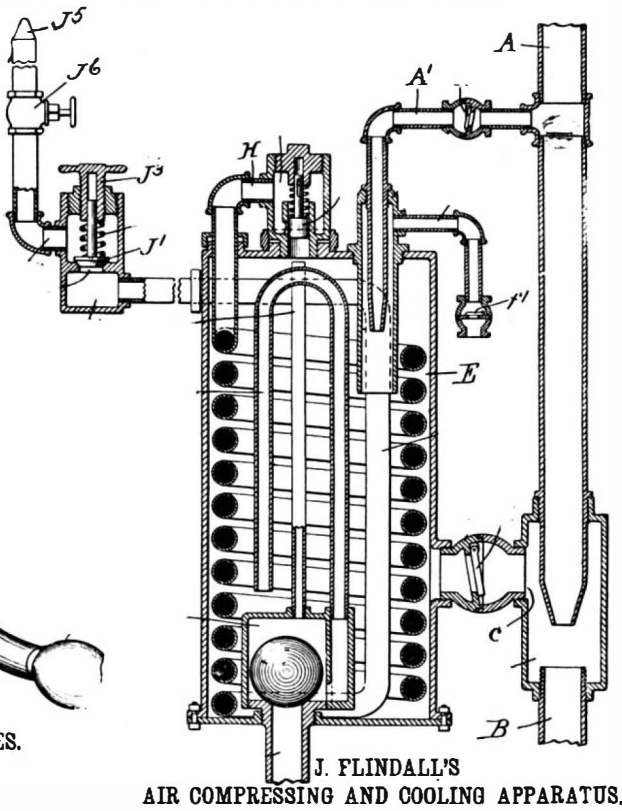
F. P. BARNEY'S SELF CLOSING GAS BURNER.



W. BELL'S OIL CAN.



H. MUIR'S ADJUSTABLE HANDLE BAR FOR BICYCLES.



J. FLINDALL'S AIR COMPRESSING AND COOLING APPARATUS.

SOME RECENTLY PATENTED INVENTIONS.

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ranged within the steam space of the boiler, and there are other combined steam boilers and engines in which the cylinder is arranged within the steam of the hot gases issuing from the boiler furnace. Neither of these arrangements have met with the desired success.

The purpose of this invention is to overcome the defects of the former devices, and to produce a combined steam boiler and engine that is able to yield a high useful effect, that requires repairs at very long intervals and does not need continual attention. These advantages are attained by arranging the cylinder of the engine within the interior of the boiler, with the lower end projecting into the firebox. The cylinder serves as a stay to the crown sheet. The engine is single acting and the valve is placed in the steam and water room of the boiler. In addition to the heating surface furnished by the firebox, a number of drop tubes are provided which add greatly to the steam generating capacity of the boiler.

ANGLE BORER.—This instrument is used in connection with a bit brace for boring holes at an angle with the angle of the brace.

The shaft, f, which fits the bit brace passes through a sleeve, A, having an arm, a, to which is adjustably clamped a rod, c, jointed at one end to the sleeve, B, and in which is journaled the shank of the chuck, C. The shank of the chuck, C, is connected by a universal joint, D, with the shaft, f. The chuck, C, receives the shank of any bit.

This device is the invention of William H. McCoy, of Miller's Falls, Mass.

GUMMING APPARATUS.—One of the figures in the engraving shows an apparatus designed for applying gum to labels. The gum being contained in a bottle which forms the font, the gum is held in the bottle by atmospheric pressure and is let down into the trough as it is used. The body of the device is furnished with a holder for the mucilage brush; also with a scraper.

To apply a bottle of mucilage to gumming apparatus, it is only necessary to perforate the cork and slip it over the nipple at the top. A small vent hole is made in the stopper, which may be brought into connection with the vent formed in the top of the device when it is required to return the mucilage to the bottle. When the vents are adjusted so as to admit air to the bottle, the trough of the apparatus may be turned so as to cause the gum to flow back into the bottle, when the bottle may be removed and corked for future use.

This invention has been patented by W. H. Burland, of Punta Gorda, Fla.

BRAZING APPARATUS.—We give an engraving of a blast lamp for brazing, soldering, etc., embodying several improvements which render it economical and efficient.

A closed tank contains a liquid fuel, such as gasoline; also air under pressure. A coiled pipe extends from the bottom of the tank to the burner, and is closed by a screw valve, D', which serves to regulate the flow of vapor to the combustion tube, D^2. The latter is perforated, and has upon its inner and outer ends forks for supporting a soldering iron. Below the burner there is a cup, D, which surrounds the tube and is designed to contain a small quantity of gasoline for the preliminary heating of the burner. A pump, E, which also forms the handle of the lamp, is employed to create the initial pressure necessary to force the gasoline up to the burner. The bottom of the lamp is made funnel-shaped for convenience in filling, and is provided with a screw plug through which the gasoline is introduced.

This apparatus is the invention of John C. Dupee, of Chicago, Ill.

ELECTRO-PNEUMATIC CIRCUIT CLOSER.—This invention relates to pneumatic dispatch or transmitting apparatus employing a column of air which fills a conduit wherein a carrier or series of carriers are propelled by the air pressure as the motive force, and the improvements relate to a circuit-closing device operated by variations of pressure taking place in the air column as the carrier passes.

This invention provides means for indicating the passage of the carrier by any fixed point. The invention is especially designed for closing an electric circuit which locks the sending apparatus at the next station on the line of a pneumatic dispatch system, or it may be used to indicate at some distant place that a carrier has passed a given point. This will be of use in determining the velocity of carriers in the tube, or in showing whether or not a second carrier should be introduced into the tube. The dispatch tube is connected by small tubes with the diaphragm cell provided with a diaphragm carrying an electrical contact held normally away from an insulated contact screw supported in the wall of the cell. When the carrier, C, moves in the direction shown by the arrow past the tube, b, the excess of pressure at a will be transmitted to the diaphragm, causing an electrical contact and thus producing a signal on the bell connected in the circuit. When the carrier passes the second tube, equilibrium is restored and electrical contact is broken.

This device is the invention of B. C. Batcheller, of Brooklyn, N. Y.

OIL CAN.—The engraving shows an oil can designed for filling the fountains of oil lamps. The can is provided with an attachment which stops the flow of oil when the fountain is full; it also admits of seeing the oil in the font. The oil can is provided with a spout of the usual description, and to the top of the can is attached a small auxiliary reservoir, E, containing a liquid. A tube of small caliber dips in the liquid in the small reservoir and extends over the tip of the spout, as shown. Another small tube extends from the top of the small reservoir through the top of the can into the air space. So long as the oil in the font is below the can nozzle, air enters the smaller tube, and bubbling up through the liquid in the small reservoir, supplies the air space of the can so as to allow the oil to flow out; but as soon as the oil in the font covers the mouth of the small tube, air can no longer enter the can, and the oil is prevented from flowing by atmospheric pressure.

This invention is patented by William Bell, of Bay Side, N. Y.

SELF-CLOSING GAS BURNER.—In the use of coal gas for lighting purposes the extinguishing of a light without the careful closing of the gas supply to the burner is a constant and alarming cause of danger. Many gas fixtures exist in which the valve has not the proper stops. Such cocks or valves are liable to be turned so as to extinguish the light and turned enough farther to permit the gas to escape. Many lives are annually lost by asphyxiation from self-illuminating gas, and often attributed to self-destruction when the fault was with the gas fixtures. Pure coal gas, formerly used, by its offensive odor gave at least notice of its escape; but natural gas and the modern water gas, while more deadly, give no warning of their presence.

Mr. Frank P. Barney, of Chartley, Mass., has patented a device which is designed to prevent the possibility of the escape of gas from a burner after the light has been extinguished. The engraving shows two forms of device for this purpose. In one of these the valve is inclosed in the burner tube, which is opened by expansion of the rod, 8', when the rod is heated, and which is closed when the rod is cooled. In the other form the stress of the cold wire, 8', holds the valve closed, and the expansion of the wire when heated permits the valve to be opened automatically by the spring.

The operation of this burner is as follows: The rod, 8', which extends through a hole in the center of the yoke, is adjusted by the thumb nut, 9, to hold the valve disk to the valve seat, so as to prevent any gas passing to the burner. When so adjusted, the rod is firmly clamped by a clamp screw. By holding a taper or a match against the rod, 8, the rod quickly expands, the valve is partially opened, the gas ignited, and as the rod, 8, expands, the flame burns bright. When now the gas is turned off to extinguish the flame, or the flame is otherwise extinguished while the gas is turned on, the rush of gas and the absence of the heat of the flame cause the rod to cool quickly and contract, thereby closing the valve and preventing the escape of gas.

ADJUSTABLE HANDLE BAR FOR BICYCLES.—Many attempts have been made to produce a handle bar for bicycles which could be quickly adjusted, and which would retain its adjustment without danger of alteration even under heavy strain. H. Muir, of Chicago, Ill., has invented a handle bar which seems to fulfill these requirements.

This device, which is shown in one of the illustrations, has the halves of the handle bar pivoted to the handle bar post, the upper end of the latter being threaded to receive a nut having a circumferential groove and a milled flange. In the groove is placed a collar, which at diametrically opposite sides is connected by means of links with the two parts of the handle bar. By turning the nut, the ends of the handle bar are moved up and down as occasion requires.

AIR COMPRESSING AND COOLING APPARATUS.—John Flindall, of Chicago, Ill., has recently patented an apparatus for cooling and compressing air.

It provides a simple and cheap means of refrigeration, by utilizing the water of the house supply, which automatically compresses and cools air, which by subsequent expansion absorbs heat and produces the temperature desired.

For a full description of this invention, the reader is referred to Mr. Flindall's patent.

THE History of the Cross Hairs in Transits, etc., is discussed by E. Hammer in the Zeitschrift fur Vermessungswesen for 1896, says Engineering News. He credits William Gascoigne, of England, with the first use of hairs for this purpose, in 1640, or a little earlier. Gascoigne fell at the battle of Marston Moor in 1644. He speaks of only hair and thread. In 1662 Malvasia employed, besides hair and vegetable fiber, silver wires. In the middle of the last century, glass and mica plates, with engraved lines, were employed in place of cross hairs; as described by Brander in 1772, and used by Breithaupt in 1780. Spider webs were not thought of until 1775, when their use was advocated by Fontana. In 1818 Struve employed fine glass threads, and platinum wire has been substituted in recent years.

Science Notes.

If the Roentgen rays come into general use for customs examinations, the dry plates of the amateur photographer will be ruined.

Mr. Hiram S. Maxim was the first man to pay a fare for the use of an electrical cab when they began running in London a short time ago.

The members of the Bryant Mount St. Elias exploring expedition report a failure as far as scientific results were concerned, but they brought back samples of good looking copper ore picked up along the Alaskan coast and report the discovery of ledges of considerable magnitude.

The trustees of the Boston Public Library will publish an exhaustive "Bibliography of Anthropology and Ethnology of Europe." It was prepared by W. Z. Ripley, of the Massachusetts Institute of Technology. The list of references cited includes 1,500 titles taken from original sources. There will also be references to original maps.

From Science we learn that the United States Geological Survey has appropriations for the present fiscal year as follows: The topographical surveys $175,000; for geological surveys and researches, $100,000; for investigation of coal and gold in Alaska, $5,000; paleontology, $10,000; chemistry, $7,000; gaging streams and water supply, $50,000; mineral resources, $20,000. Besides there are allowances for illustrations, printing, etc. The same bill also appropriates large sums for other surveys of the public forest lands, Indian Territory, etc.

The barkentine Maggie arrived at North Sydney on August 31, from Nachook, Labrador, bringing news of the Dominion government's Hudson Bay expedition steamer Diana, which left Halifax last May. She is in the north to determine if the waters of Hudson Bay may be navigable for grain steamers during the summer months. On July 15 the Diana was nipped in the ice near Fox Channel, when her rudder was carried away and the port side was badly strained. Repairs were effected, and on August 13 she continued her voyage for Cumberland and Fort Churchill in Hudson Bay.

In order to ascertain whether it is possible for a human body to become completely dissolved by submerging it in a solution of crude potash, an experiment was tried a short time ago at the Rush Medical College, Chicago, Ill., in the interest of the district attorney, who wished to convict of murder a man who was accused of killing his wife and making away with her body by subjecting it to the action of potash. The experiment showed that although the cadaver remained in the bath for a considerable length of time, nothing remained but a few bits of bone, which presumably would also have become dissolved if allowed to remain longer.

Additional information concerning the use of acetylene is furnished in the simple method devised by A. E. Murphy, of Essex, England, for blowpipe work and in atmospheric burners, and communicated by him to Nature. An ordinary Bunsen burner of special dimensions is employed, with a very small jet for the gas—this for the laboratory—and the burner tube is covered with a cap to exclude dust when the burner is not in use. The acetylene is generated under about seven or eight inches water pressure; with six inches pressure a perfectly clean flame of good size can be obtained, the flame burning steadily and noiselessly, with a consumption of about one cubic foot of the gas per hour. The flames are found to be possessed of great heating power, one volume of acetylene being for practical purposes nearly twice as effective as one volume of ordinary gas. This, it is declared, means an immense saving of time in all heating operations, and in many cases the use of a blowpipe can be dispensed with, the burner alone being quite hot enough for small fusions and simple glass making operations.

An important subject about which very little experimental information is on record is that of the supporting power of soils, but recently the city engineer of Vienna has taken up the investigation and designed an instrument for exact measurement, and also a practical apparatus for the use of builders and bridge builders, says the Railway Review. He has ascertained that up to a certain limit the depth to which a given loaded area sinks is directly proportional to the load which it bears, and this limit should in no case be exceeded. His apparatus consists of a base plate and cylinder into which a plunger is fitted and upon which weight can be placed corresponding successively to uniform pressure per unit of area. The corresponding sinking of the plunger into soil is then very precisely measured by a micrometer upon a multiplying column. For practical use of builders this apparatus is replaced by a rod carrying a divided head, upon which a tube containing a spiral spring is fitted. The end of the rod is provided with a number of tips of various determined areas, in order that one adapted to the nature of the soil may be selected, and, by pressing this on various portions of the ground to be tested and taking readings from the spring scale, the relation between the pressure and the penetration may be obtained.

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A LARGE STATIC MACHINE.

Messrs. Waite & Bartlett, of this city, have just completed for Dr. F. A. Gardner, of Washington, the largest influence or static machine ever made. It is to be used for generating electricity applied as a therapeutic agent, and it is of sufficient size to admit using it for the treatment of several people simultaneously.

Presuming our readers are familiar with ordinary static machines as described in several numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT, we will confine ourselves to a brief description of this particular machine.

The machine is furnished with a hermetically sealed case made of quartered oak and plate glass. The case is 10 feet long, 5 feet wide, and 7 feet high inside and is supported a few inches from the floor by six legs.

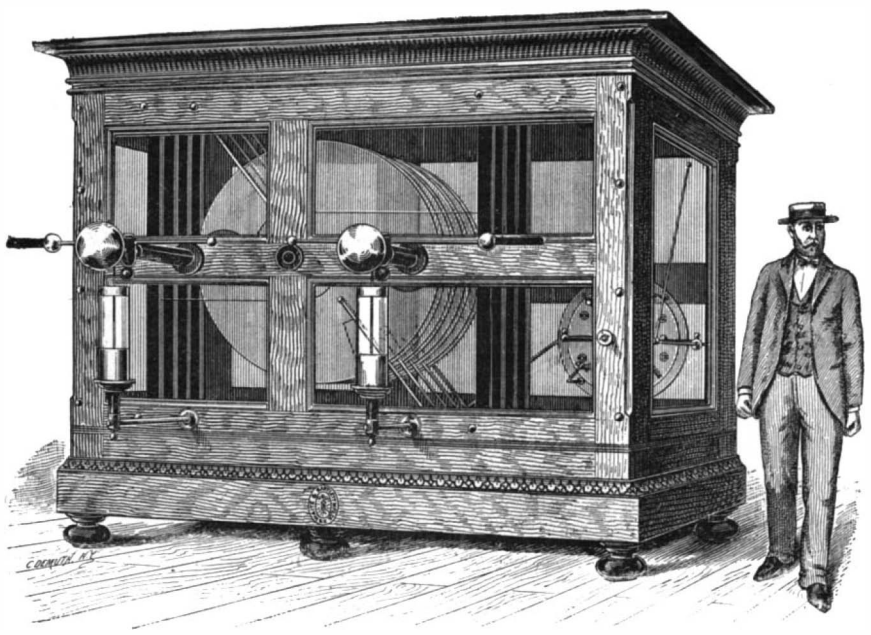
The main shaft, which is of steel, is 2 inches in diameter and turns in ball bearings. It carries eight plate glass plates 60 inches in diameter and ⅜ inch thick. Between the circular glass plates are supported the fixed plates which carry the armatures.

The conductors extend through the casing and are provided with spherical terminals 8 inches in diameter, and with condensers and sliding discharge rods.

A small Toepler-Holtz machine having a 28 inch revolving plate is placed in the casing, and may be brought into connection with one of the armatures of the large machine, when it becomes necessary to renew the charge. The small machine may be driven by hand; an electric motor operates both.

This machine is capable of yielding a 30 inch spark of large quantity. The discharge is terrific. It requires a person of unusual nerve to remain quiet during the disruptive discharge of the machine, and yet the current can be controlled so as to admit of treating the most delicate and sensitive parts of the body.

The machine, taken altogether, is a very creditable piece of work, in which the makers may justly take pride.



GIGANTIC HOLTZ MACHINE.

THE KING OF SIAM.

The close of the season which was marked by the Diamond Jubilee celebration was invested with special interest by the visit of the King of Siam, the latest Oriental potentate to declare himself a supporter and advocate of European culture and progress. The portrait we publish of his Majesty, King Chulalongkorn, and some of his sons, will give our readers a good impression of this highly intelligent and amiable ruler of what may be called the last virgin kingdom of Asia, and that impression will certainly be confirmed and strengthened by closer intercourse. The world has heard a good deal and seen ample proof of Japanese receptivity and go-aheadness. The prediction may be hazarded that now that the Siamese have decided to imitate Europeans, they will show not less intelligence and energy in shaking off the trammels of centuries and in catching up the age. It is both fortunate and gratifying that the present sovereign of Siam, to whose initiative and example the change is mainly due, is inclined to regard this country with a special admiration, and to take English customs as his pattern and example.

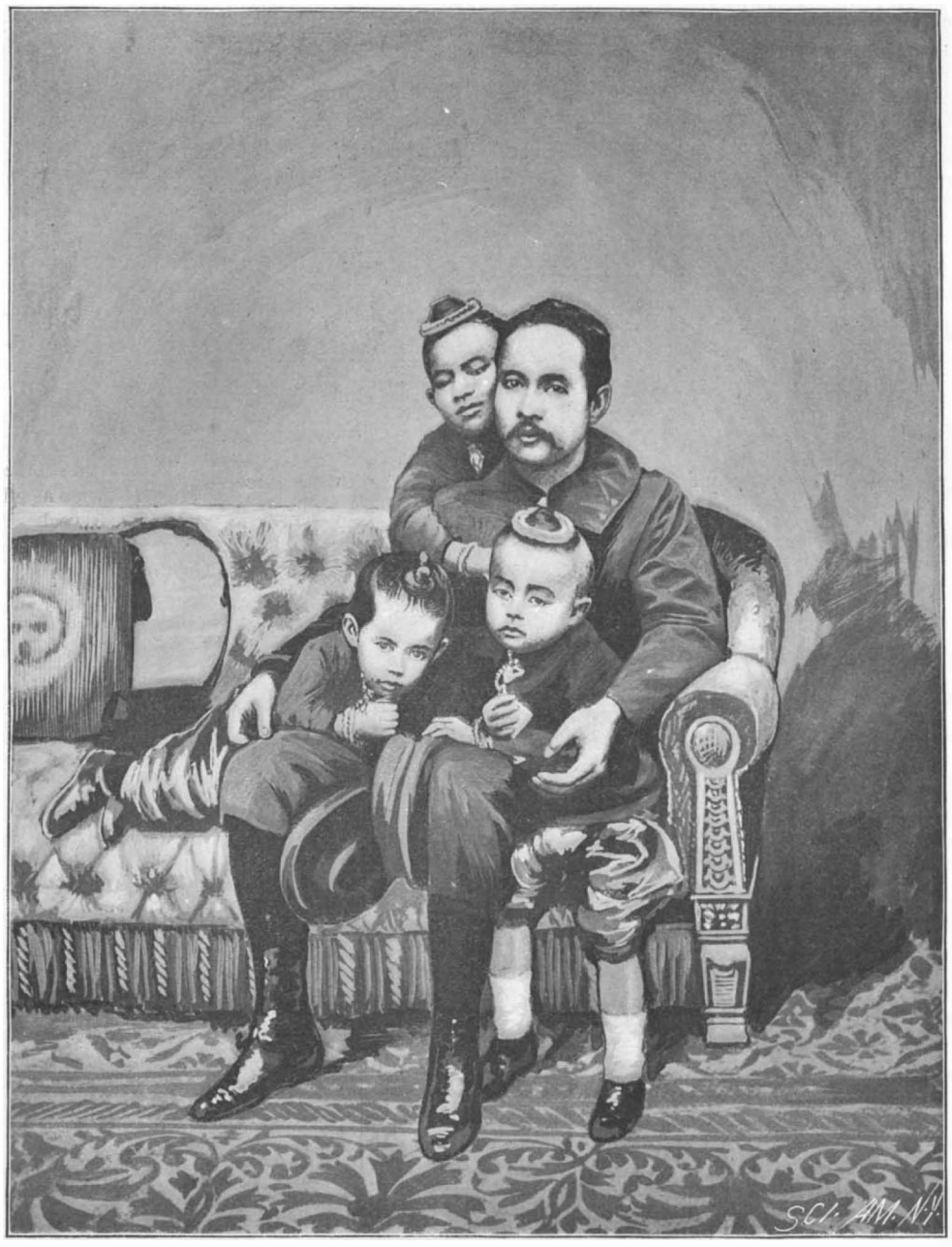
Chulalongkorn has had a long experience of the work of government, having succeeded to the throne in 1868, when he was only fifteen years of age, and during that period he has seen his country pass through several grave crises, of which the most serious occurred only three years ago, when it seemed as if French ambition could not be warded off. Everyone acquainted with the diplomatic history of that episode is aware that the good sense and patience of the King played a prominent part in effecting the pacific settlement that was finally attained in the spring of last year by the convention signed by England and France. That convention guarantees the independence and neutrality of Siam, and could not be broken by either of the signatories without bringing the other into the field as the champion of Siam. Its practical value and significance therefore is that Siam has obtained a breathing space which will enable her to develop her resources, introduce needed administrative reforms, and generally strengthen her position. How clearly the King has seen these facts, and how quick he has been to begin the necessary measures, is shown by his early departure for those foreign lands to which his own has now to assimilate itself.

If the King has visited Europe from those high and meritorious considerations, it must also be admitted that his decision brings within our ken a very charming personality. No Oriental potentate will leave a more favorable impression behind him than the Siamese ruler, whose character, disposition, and deportment will attract unqualified admiration here as placing his Majesty at once en rapport with English gentlemen. The King's knowledge of English, which dates back from the time of his childhood, when he began his studies under an English governess, is very considerable, and will undoubtedly simplify his relations here, and at the same time contribute to a more perfect and harmonious understanding. It is stated on good authority that during the voyage to Italy from Bangkok on board the royal yacht Mahachakhri, the King ordered that only English should be spoken at his table. His Majesty has also specially arranged for the education of his sons in the first place in England.

The Crown Prince Somdetch has an English governor, Col. Hume, an officer who served for a long time on the staff of Lord Roberts, in India, and several English tutors have superintended his studies. He is a young and intelligent prince, of whom every one speaks well, and who worthily represented his father during the recent ceremonies. The next son, Prince Borapat, although now a cadet at the Potsdam Military School, also had the basis of his education laid in this country, and when he was sent to Germany to undergo the severe military and educational training to which princes are subjected in that country, he astonished his examiners by the excellence of his papers at the preliminary examination. The board sent the Siamese prince's replies to the Emperor William, who, in turn, passed them on to his sons with the comment, "These are what good examination replies should be like." The third son, Prince Abha, has been specially educated for the sea, and was trained at one of our best naval schools at Greenwich. We believe that he was allowed by the First Lord of the Admiralty to take part in one of the naval examinations, and that he did remarkably well in most of the subjects, and only broke down in "religion," which is scarcely surprising. He accompanied his father on board the Mahachakhri, on which he is rated as a midshipman, and he was intrusted with the steerage of the vessel through the Suez Canal. Capt. Cumming, the commander of the yacht, reported that he performed this task very skillfully. Enough has been said to show that not merely is the King of Siam a well educated and well informed prince himself, but that he has taken very special pains to make his sons and successors competent to discharge the onerous duties of their exalted position under more severe conditions than in the past. The conclusion is, therefore, obvious that Siam stands on the threshold of important changes, and that in another generation it will have become a very different kingdom from what it was quite recently.

This change can undoubtedly be accelerated by the encouragement and co-operation of the English authorities and capitalists, and seeing that our intercourse with the country goes back 300 years, and that the latent wealth of the kingdom is immense, we should fall very far short of our traditions if we held back from utilizing so promising an opening. The serious object of the King's visit is to study our manufactures and mechanical processes, and to introduce such of them as are feasible into Siam. Then there follows the question of attracting foreign capital for the construction of railways and the working of mines. Foreign capital is undoubtedly timid of embarking on any ventures in Asiatic countries; but Siam offers a secure as well as a specially favorable field, and the support of the King and the chief members of the royal family provides a sure guarantee that is absent elsewhere. It is therefore reasonable to count on a special measure of success in this respect as the direct outcome of the King's visit. Commercial men can scarcely fail to realize and appreciate the possibilities of trade in the Menam, or of the development of the southern provinces of Siam, where tin and gold are known to abound. But political considerations not less strongly point to the advantages that must accrue from the development of Siam, and from placing her, as it were, firmly on her own feet. We are the supporters of Siamese autonomy, but as much cannot be said of the French, who are always complaining of the Siamese, and who seem to regret the convention that ties their hands, although we only yielded to them on the Upper Mekong with the object of effecting a pacific and satisfactory arrangement on the town, Menam.

We cannot forever stand in the path before a decrepit Siam, and therefore that country has to regenerate itself and to establish its



THE KING OF SIAM AND CHILDREN.

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own title to be respected. This is what the King fully realizes, and he has taken on himself the task of showing his subjects by his personal example the road they have to follow.—St. Paul's.

The Recent Floods in Eastern Germany and in Austria.

The American papers have taken little notice of the dreadful floods that have produced such destruction in Germany and Austria. The region stretching from east to west between Silesia and the kingdom of Saxony was, in the closing days of July, the scene of dreadful catastrophes, the ultimate cause of which were heavy rainfalls. These reached their climax on the 29th and 30th of the month and affected primarily the mountainous districts, flooding the northern slopes of the Erzgebirge and the mountains of Saxony and Bohemia. But the swollen rivers soon poured their overflow broadcast over the prosperous valleys, and the waters of the Elbe and Mulde reached in quick succession the towns of Bitterfeld, Dessau, Wittenberg and Magdeburg, within the first week of August. At the same time the Neisse and the Bober were working harm in Silesia. Not till August 5 did the Danube endanger the Hungarian lowlands from Presburg downward.

The awful extent of the disaster may be imagined from the figures obtained by the Meteorological Institute of Chemnitz, Saxony, as representing the total rainfall on the two days above mentioned for the kingdom of Saxony alone. Over 160,000,000 cubic yards of water were recorded. The losses were alarmingly great. In Silesia the total damage suffered was estimated at $5,000,000. In Saxony, not taking into account the destruction of all harvest products, we must take the damage sustained to represent at least $17,000,000. At Hainsberg, near Dresden, where the two Weisseritz rivers unite, the floods tore down the railway embankments, damaged some factories, destroying 90 tons of merchandise, swept away several storehouses, and devastated the fields. One arm of the river branched out and sent a tearing torrent through the principal street of the city, whereby houses were undermined and building after building was razed to the ground, the street being soon left one string of desolate ruins. Some houses have disappeared altogether, leaving no trace on their former sites. The flood swept away people, cattle and animals of all sorts, houses, furniture, altogether, in one current. The water got into the mines in the neighborhood, playing serious havoc with them. The ground was so rent by the water that it finally gave way, and a large factory was almost entirely demolished, the water rushing down the pit, carrying with it many people. Private houses and shops often buried human beings under their ruins, in one case ten persons at one time. Thirty houses were destroyed in Hainsberg, thousands of animals were lost, and many families reduced to beggary.

The valley of the Mulde was more fortunate, and the losses are mostly of property. The crops are swept away, only a very small fraction being recovered from the water.

In the Riesengebirge the floods were rendered all the more dreadful by the fact that most people were surprised by them in the night, and very few were able to save more than their lives. Trees and roofs were full of people clamoring for help. Others, who would or could not part from their possessions, were drowned. Many houses have disappeared, leaving no trace of their position, among them the electric station of the village of Schreiberhau. Fifteen houses and many barns, etc., were utterly destroyed. The calamity was further increased by the gas lamps giving out, leaving the struggling men and women in the dark night. Of one street scarcely anything is left, and another has lost some 330 feet.

South of the Schneekoppe (the highest mountain of the Riesengebirge), the little brook Aupa, ordinarily very harmless, swelled to a powerful torrent and inundated the city of Trautenau. Floods had been witnessed there in 1858 and 1882, but they did not approach this year's in extent. The firemen of the locality took up the rescuing work, and in one case assisted a physician, Dr. Maly, in saving 32 people from certain death. On one occasion, a child floating about in its cradle was saved. Fourteen bodies were picked up which were so mangled that they could not be identified.

In Marschendorf twenty-eight houses were utterly destroyed and thirty more very badly damaged.

Vienna, too, was partly flooded, but here, thanks to the excellent provisions against such emergencies, no serious harm was done.

In a number of other places the floods worked great harm, taking many lives and devouring millions of property; the fields having been made unfit for cultivation for several years to come. Great poverty will necessarily come to many people in a land where money is scarce at all times. Collections were, of course, set on foot by many persons to alleviate the evil, and the governments, too, are inquiring into the matter, with a view of ascertaining the extent of the damage done and the aid that can be given.

THE records of the United States Patent Office show that upward of 6,500 forms of car couplings have been patented in this country.

Restrictions in Use of Wood for Interior Fittings of Ships.

As the result of the experiences drawn from the battle of the Yalu, the use of wood has been much restricted in the new German ships, according to Herr A. Dietrich, Constructor in Chief of the Imperial Navy, says the Proceedings of the United States Naval Institute.

"In the outfit and construction of the new German ships wood is used only for a few minor points. Wooden deck planks are no longer laid; steel deck plating is covered with linoleum, sometimes over a layer of cork. In the crews' quarters the sides of the ships are not ceiled. In the officers' rooms the ceiling is made of steel plates 1½ millimeters thick and lined with cork. For cabin bulkheads the steel is covered with thin woolen cloth, and with cork lining underneath where it is desirable to exclude sound or lower the temperature. Where heat is radiated from engine or funnel casings, cork lining is resorted to. All wood is removed from the ammunition rooms, save the racks for shells and powder charges, which are still made of wood. For all ladders and steps steel is used. The handrails on the conning bridges are no longer of wood, but of some other material which will not burn or splinter, and which is more agreeable to the touch of the hand than steel or brass. Chart-houses and captains' rooms on bridges are entirely made of steel and fitted out with non-combustible materials. Since all such changes will be a little exaggerated, it seemed to be advisable to abandon wood for the interior fittings, and especially for the furniture, and to resort to fireproof material which will not splinter. Many things were tried. Furniture was made of steel and aluminum, lined with cork and covered with linoleum or canvas; but it was not equal to wood furniture. Only the bedsteads are constructed of iron, steel or brass. The insignificant quantity of wood in the few pieces of furniture when ignited is not a dangerous source of smoke, but rather it is the outfit of the staterooms, the mattresses, blankets, clothing, books, etc. However, for the present, wood cannot be abandoned entirely. Top signal masts, flag poles, etc., will be made of steel, but there one cannot save weight. The fighting capacity of the ships is without doubt increased through these innovations, since the ship is less apt to burn, the effects of splinters are restricted, and considerable weight is saved, which is available for ordnance and armor."

It may also be mentioned that in German ships of war the protective under-water deck is never cut through either for ventilation or coaling purposes.

RECENTLY PATENTED INVENTIONS.

Engineering.

STOP MOTION FOR GOVERNORS.—George F. Boos, St. Mary's, Ohio. In centrifugal governors for engines and other machines, the stop motion, according to this invention, is arranged to at once shut off the motive agent in case the governor driving belt slips off, breaks, or becomes unserviceable. A cam mounted to turn is controlled by an arm carrying an idler pulley for the belt, and a spring-pressed lever held in engagement at one side of its fulcrum with the cam has connection with the valve stem at the other side of the fulcrum. In case of accident the downward swinging of the arm is very sudden, causing an immediate closing of the valve.

Railway Appliances.

CAR FENDER.—John Landau, Jr., Brooklyn, N Y. To prevent people being run over or injured by street cars this inventor has devised a fender which is sufficiently yielding, when one is caught by it and received into its basket, to prevent rebound of the body, or its being thrown out, before the car is brought to a standstill. The improvement comprises a spring-pressed lever frame fulcrumed on brackets attached to the sides of the car platform, the car having such brackets at each end, and removably hung on this frame is a basket frame, which may be conveniently moved from one end of the car to the other, only one basket being used.

SWITCH OPERATING MECHANISM.—Charles E. Harris, Ellwood City, Pa. A switch controlling apparatus which may be operated from the car is provided by this invention, which comprises essentially a toggle joint mechanism connected to the cross bar which throws the movable portions of the track, the operating mechanism consisting of crank shafts extending across the track and operated upon by pivoted levers which extend lengthwise of the rails, the lever being depressed by wheels mounted on the car axle, the arrangement being such that they may be shifted laterally to engage the proper lever or to clear all the levers.

Electrical.

TROLLEY.—Frank W. Canalese, Portland, Me, The grooved wheel which takes the current from the trolley wire, according to this invention, is arranged to turn in a plane at right angles to the plane of rotation of the wheel, to accommodate itself to the wire when the trend of the latter is different from that of the railroad track. Combined with a trolley pole and supporting frame having an annular top plate is a cap turning on the top plate and carrying standards in which the trolley wheel is mounted, double acting springs holding the wheel normally in a central position relative to the pole, while a fork pivoted to the pole is apertured to receive the pivot of the trolley wheel.

Bicycles, Etc.

REAR ADJUSTING FORK.—John J. Naregang, Leesport, Pa. Instead of the ordinary coupling at the rear apex of the diamond shaped trussed frame, whereby the rear axle is inserted or removed in an open slot, and may be adjusted to tighten or loosen the chain by means of a set screw, this improvement provides a novel construction by which the removal of the axle and its readjustment, without breaking or opening the chain, is more conveniently effected. The axial pin, having a screw-threaded end, is arranged in a slotted frame plate, and a screw-threaded cone bearing fits on the axial pin, on the end of which is a clamping nut, while an adjusting screw having a forked end loosely embraces the axial pin.

BICYCLE SADDLE.—Charles H. Young, New York City. This invention covers a novel construction of the spring frame of the saddle, designed to retain the saddle in its normal form, and the shape of the saddle is designed to conform to the parts which contact with it in such a way as to cause the surfaces which should naturally bear the weight of a rider to be supported, while other parts liable to injury are relieved from pressure, the saddle having the form required by nature for easy and safe riding.

BICYCLE REST.—Eugene Church, Tacoma, Washington. This is a device to facilitate cleaning a bicycle, holding it upturned and reversed, in such way that every part may be readily reached, or the frame or parts of the machine may be conveniently repaired. It has four legs, which fold closely together to take up but little room when not in use, and a head block in which is a rest to engage the frame of the bicycle just above the crank hanger, two of the legs being then attached to the handle bars by cords, while the two other legs are similarly secured to the center brace at each side of the saddle, the necessary cords being permanently attached to the legs.

TIRE.—Jacob A. Lewis and William G. Spiegel, New York City. This is a pneumatic tire made in sections, each of which is adapted to be independently inflated, means being provided for holding the several sections firmly on the rim of the wheel and in engagement with each other. The preferred manner of joining the sections together is by means of a stud at one end fitting into a corresponding depression in the end of an abutting section, and it is also designed that the tread surface shall be slightly stepped, one section projecting slightly beyond the abutting end of an adjacent section.

SPEED INDICATOR AND CYCLOMETER.—Willis H. Ostrander, Boston, Mass. This combination device for indicating the speed and at the same time registering the distance covered is applicable not only to a bicycle, but may be used on a wagon, a steam engine, or a vessel. It has a centrifugal-operating governor adapted to throw an indicator hand a distance over the dial corresponding to the speed of travel. Its casing is divided by a horizontal partition into a lower and upper chamber, the upper wall of the latter having a dial graduated to indicate the rate of speed, and also having openings through which figures on distance-indicating wheels may be seen.

Mechanical.

WRENCH.—Harry S. Noble and Charley M. Tussing, St. Mary's, O. This is a tool having a fixed and a sliding jaw, and means for holding the latter at any adjustment within its range of movement. The shank of the tool has a series of broken threads, at one side of which runs a longitudinal rib, while a thimble revolubly connnected with the sliding jaw turns on the shank, the thimble having broken internal threads coacting with the threads on the shank, the threads of the thimble being capable of moving through the space between the ends of the threads on the shank when not engaging such threads.

STOCK AND DIE.—George G. Doyle, Ogden, Utah. This is a tool more especially designed for the use of plumbers and other mechanics, and is arranged to permit of using different sized dies on the same stock, and having the dies of each set always set to cut the threads accurately, and so that no iron chips can get under the dies, so that they will not track or follow each other. The centrally apertured die plate adapted for attachment to the stock has slideways ranging toward the center of the plate at the aperture, the dies being mounted to move on the slideways, while adjusting devices carried by the plate engage the dies.

MECHANICAL MOVEMENT.—Sidney M., James T., and John A. Polson, Laclede, Mo. These inventors provide a simple mechanism designed for use in well drilling and other machinery, permitting a long drop of the working tool and requiring but a comparatively small amount of power for again lifting the tool. At one side of the center of the face of a continuously rotating crankhead is pivoted a rope-carrying arm, and a stop is fixed to the crankhead face at or near the opposite side, the stop being adapted to engage the free end of the arm once in each revolution and carry it around until it passes over its pivotal center and drops forward, producing an alternate lift and drop motion while the crankhead is being rotated continuously in one direction.

Agricultural.

GREENHOUSE.—William H. Witte, Baltimore. Md. To enable the valuable space of the walks to be utilized for benches carrying plants, etc., the greenhouse, according to this invention, is provided with rails extending transversely of the greenhouse walk, and a wheeled framework carrying a bench is adapted to travel on the rails, means being provided for raising and lowering the bench on the framework. Two stationary benches are also held at different heights, there being a walk between them, while a frame is capable of moving transversely out from beneath the higher stationary bench to occupy the walk.

Miscellaneous.

TYPE SETTING AND LINE CASTING MACHINE.—Charles J. Botz, Sedalia, Mo. Pivoted type bars, each carrying at one end a matrix, according to this invention, are adapted to run on guides, to be readily arranged in any desired succession, and then clamped in form for the matrices to produce a line, when a pivoted casting box is swung over to engage grooves at each side of the matrices, and the metal may be poured to cast a line. A novel form of distributer is also provided for returning the type bars to their original position, the entire apparatus being carried by a light framework.

RANGE GAS GENERATOR.—Miguel Velez, New York City. A gas plant especially adapted for generating wood gas has been devised by this inventor, and one which may also be used as a range in public and private buildings, the gas being generated from wood or other vegetable substance. In the range is a retort connected with a gasometer, a gas outlet pipe being connected to a movable dome, and a purifier and washing device being connected with the retort. The apparatus connected with an ordinary range is designed to feed from twenty to twenty-five burners, the gas being burned with a mantle and thus giving an incandescent light.

STREET SWEEPER.—Alvin Brown, Aurora, Ill. This sweeper as it moves along sweeps the dirt and refuse in its path up into a casing or receptacle from which it may be automatically dumped as required. Its rear wheels have rubber tires, that it may run noiselessly, and they serve as drivers for the brush drum arranged transversely within the enlarged rear portion of the casing, there being a gear and lever mechanism for throwing the wheels into and out of connection with the brush drum shaft. A series of narrow brush belts, arranged side by side, is employed in preference to a single broad belt, facilitating repair and substitution when requisite.

WEIGHING AND DUMPING VEHICLE.—George H. Fletcher, New York City. To provide a wagon or cart with means by which the purchaser of a commodity, such as coal, may, if desired, ascertain the correct weight of the quantity delivered, or whereby it may be weighed by the seller as it is placed in the vehicle, is the object of this invention. Provision is made for weighing the load by a scale beam and weight or by a platform or spring scale, according to the desired construction, and simple means are provided by which the body may be raised and inclined to dump the load, either laterally or at the rear.

DUMPING BOX OR BUCKET.—Michael W. Peterson, Elliott, Ill. This improvement is especially designed to facilitate handling ear corn or grain in cribs,

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warehouses or granaries, but may be used for handling coal or other commodities. The box or bucket has a hinged bottom and securing link, while the bail has a projecting steering arm which may be adjusted to and secured in any desired position, a tripping rope serving also as a steering rope.

TOBACCO STEMMING MACHINE.—Milton C. Baughan, Richmond, Va. This invention provides a mechanism whereby the spread leaf is folded and carried forward, turned at right angles to bring it into alignment with the belts of infeeding devices, and is then stemmed in a manner closely resembling the way the work is done by hand, the tobacco being handled from the point or tip end of the leaf. The stem is effectually removed, whether it be intact and unbroken from end to end or broken or cracked in one or more places.

MUSICAL INSTRUMENT PEDAL.—Frank H. Dernell and Phillip H. Brehmer, Rutland, Vt. This invention provides an organ pedal attachment for pianos which may be disconnected in a ready and convenient manner and folded up to occupy but little space, the attachment being so made as not to detract in the least from the appearance of the instrument and enabling any one who has a piano to secure church organ practice at home.

ATTACHMENT FOR STRINGED INSTRUMENTS.—Justus L. Kelman, Maroa, Ill. For guitars, mandolins, banjos, etc., this inventor has devised an attachment to permit the performer to conveniently press a number of strings and readily sound the chord when the corresponding stringe are picked. Arranged in a suitable frame are sets of pressers, each adapted to press a set of strings into chord position, bars actuating the pressers and keys actuating the bars, sets of levers engaging the bars being actuated from the keys, and each lever being provided with adjustable blocks for engagement with the corresponding bar.

CLASP.—Jennie Walker, Brooklyn, N. Y. This is a device more especially designed for use with shoestrings, laces, etc., the clasp holding the bow of the lace at one or more points so that it will not become untied. It comprises a body on which are fastening devices, a cover entirely embracing the body, and the edges of the cover, together with the bottom of the body, being arranged for contact with the surface to which the clasp is applied. The clasp is smooth upon all sides, having neither end nor side projections or roughnesses of any kind to catch in the clothing.

SASH LOCK.—Richard A. Haegelin, St. Joseph, Mo. This is a strong and simple device for conveniently locking the sash closed or in any desired position, supporting it equally at both sides and preventing rattling. It consists principally of bolts adapted to engage with their free ends the window frame, toggle levers connected with the bolts, and a device for opening and closing the toggle levers toward or from each other, to carry their free ends out of or into engagement with the window frame.

STOVE.—Chauncey T. Andreas, Bayfield, Wis. This is an improvement in stoves having air heating tubes or flues arranged in the combustion chamber, there being two series of vertical air flues arranged opposite each other within the casing, a rear vertical outlet flue having two lateral openings at the bottom, a central opening at the top, and a central air inlet at the front, which extends down to the bottom of the combustion chamber.

COOKER.—Annis B. Eighmy, Clifton Springs, N. Y. A main chamber and a water chamber in this cooker are separated by a vertical partition, the chambers having a common bottom beneath which is a hot air chamber. The main chamber has a diaphragm to support vessels, a vertical air tube extending above the diaphragm, and a second diaphragm being placed above the air tube, with other novel features, the cooker being provided with compartments and receptacles which may be used for boiling, baking, steaming, and any process ordinarily followed in cooking.

WATER CLOSET FLUSHING, ETC.—William A. Eberhart, Asbury Park, N. J. The apparatus provided by this invention comprises a tank having a discharge pipe to the upper end of which is secured a cap, but spaced from the pipe sufficiently to allow water to flow between the pipe and cap, while a vertically movable inverted cup has guided movement on the cap, the apparatus being designed to secure the positive discharge of the full quantity of water it is intended to supply at each flushing operation.

APPLYING REMEDIES.—Paul J. Fouquier, San Francisco, Cal. This invention comprises a simple appliance for holding lozenges, pastils, medicines, antiseptics, etc., in the mouth in such manner that they may be retained there for a considerable length of time until they are gradually dissolved or inhaled.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS, ETC.

VALVES AND VALVE GEARING. A practical text book for the use of engineers, draughtsmen and students. By Charles Hurst. With numerous illustrations and four folding plates. London: Charles Griffin & Company, Limited. Philadelphia: J. B. Lippincott Company. 1897. Pp. 135. Price $3.

The author has succeeded in his expressed intention to deal with the subject of valve gearing in a simple and interesting manner. Without any unnecessary preamble, he commences with a clear explanation of simple valve gear and gives formulæ for finding the area of ports, the lead, cutoff, percentage of release and compression, etc. Chapter I deals with slide expansion gears, and then follow two chapters on link motions and other reversing gears. This concludes Part No. I. The second part is devoted to Corliss valves, and the four chapters deal successively with gears without trip motion; single eccentric gears with trip motions; double eccentric gears, with trip motions; and single eccentric gears, with large range of trip. The work is free from any elaborate theoretical discussions, and the explanations of the various types of valve gear are accompanied by diagrams and sectional views of the parts which render them easily understood. The book is admirably suited to the needs of the practical mechanic.

THE CALCULUS FOR ENGINEERS. By John Perry. London and New York: Edward Arnold. 1897. Pp. 378. Price $2.50.

This is an excellent work on the calculus for mechanical and electrical engineering students, and includes what has been the most important part of the regular course in the Finsbury Technical College. It has been supplanted by easy work from other authors. The chapters are devoted to the study of x^n; compound interest law, the harmonic function and general differentiation and integration. Another book on the calculus has been needed for some little time, and the present work fills a long felt want.

BILDER FRAN SVERIGE. Utgifna af Avenska Turistföreningen. Views of Sweden, published by the Swedish Touring Club. Leipzig: R. F. Koehler. Pp. 110.

This is a pamphlet filled with exquisite half tone illustrations of the scenery of Sweden, both in town and country. It is little wonder that Sweden is considered one of the choicest resorts for tourists which the civilized world has to offer. The Swedish Touring Club is to be congratulated in the production of this handsome book.

SCIENTIFIC AMERICAN BUILDING EDITION

SEPTEMBER, 1897.—(No. 143.)

TABLE OF CONTENTS.

No. 1. Plate in colors, also another perspective elevation and floor plans of a residence at Bensonhurst, L. I., recently erected for Mr. Walter Jones. A design treated in an attractive style of architecture, with Colonial feeling and classic detail. Architect and builder, Mr. Walter Jones.

No. 2. A Colonial residence at Springfield, Mass., recently completed for Mr. N. N. Fowler, at a cost of $13,000 complete. Two perspective elevations and floor plans. Mr. Guy Kirkham, architect, Springfield, Mass.

No. 3. Residence at Scranton, Pa., recently erected for Mr. Thomas R. Brooks. A unique design. Two perspective elevations and floor plans. Mr. John A. Duckworth, architect, Scranton, Pa.

No. 4. Elm Park Methodist Episcopal church and parsonage at Scranton, Pa. Two perspective elevations and floor plans, also two perspective elevations of the parsonage, with floor plans. Architects, Messrs. George W. Kramer & Co., New York City.

No. 5. English dwelling at Overbrook, Pa., recently erected for Mr. Smucker. An attractive design treated in the English style, half timber and stone. Perspective elevation and floor plans, also interior view. Architect, Mr. William L. Price, Philadelphia, Pa.

No. 6. Cottage at Binghamton, N. Y., recently erected for Mr. G. N. North, at a cost of $3,200. Two perspective elevations and floor plans. A design with many excellent features, good elevations and well arranged plans. Mr. Elfred Bartoo, architect, Binghamton, N. Y.

No. 7. Modern cottage at Nyack, N. Y., recently erected for the Rev. Edward Mitchell, at a cost of $2,500 complete. Two perspective elevations and floor plans. A unique design for small cottage. Mr. George F. Morse, architect, Nyack, N. Y.

No. 8. Modern suburban villa at Chestnut Hill, Mass., erected for Messrs. Merriam, Isbenbeck & Alvord. A design well treated in the modern American style with Colonial detail. Two perspective elevations and floor plans. Architect, Mr. J. H. Morse, Boston, Mass.

No. 9. A residence at Binghamton, N. Y., recently erected for Miss Q. M. French. Perspective elevation and floor plans. A very attractive design with excellent elevations.

No. 10. An actress' home at Chevy Chase, Md., illustrating the residence of Miss Annie Lewis. Two perspective elevations and floor plans. Mr. Louis D. Meline, architect, Chevy Chase, Md.

No. 11. Half page design of the New Rathsapotheke in Bremen.

No. 12. Pulpit of the Cathedral of Sainte Gudule, Brussels.

No. 13. Miscellaneous Contents: New York as a furniture market.—Advantages of fresh air in apartments.—Exterior plaster for dwellings.—Rules for making good mortar.—Premature occupation of new homes; a test for relative humidity of habitable apartments.—Ventilation of apartments.—Does your faucet leak?—A new recording thermometer, illustrated.—Beautiful work in wood finishing.—Slate roofs.—Dec-co-re-o, illustrated.—Berkfeld filter, illustrated.

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Notes & Queries

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Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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Minerals sent for examination should be distinctly marked or labeled.

(7212) W. H. M. writes: I have your "Experimental Science," by George M. Hopkins, from which I have made the simple electric motor, the hand power dynamo, induction coil, camera and telephone, with very gratifying success in each instance, and am now building the easily made telescope. 1 Now what I wish to know is this: On the astronomical eyepiece you say the eye lens should be ½ inch focus, the field lens 1½ inch focus, and distance apart 1 inch. Now is this distance measured from the plane face of each lens or from the convex side of the eye lens to the plane face of field lens? A. The 1 inch is the distance between the lenses, i. e., the clear space. 2. Also where can I get the necessary focus and distance apart of lenses for the stronger astronomical eyepiece that you suggest should be made for the instrument? I am using the 2½ inch meniscus lens for objective. A. The eyepiece is called in the books the Huygenian or negative eyepiece, in which the curved faces of both lenses are turned away from the eye. In this eyepiece the ratio of focal lengths of the lenses is always 3:1 and the distance between is half the sum of the focal lengths. For a stronger eyepiece you might use lenses whose focal lengths are 1 inch and ½ inch, and place them ⅔ inch apart. You will find these rules in the "Encyclopedia Britannica," vol. 23, page 143. This you can see in some library in your city, without doubt. 3. Where can I get information necessary to build a microscope? I mean, of course, a fairly powerful one that will show the animal life in water. A. We would suggest that the best way for you to get the dimensions of a compound microscope is to seek the professor of physics in one of the colleges or high schools, and tell him what you have done and wish to do. You will probably find him willing to help you and to allow you to measure and copy his instruments.

(7213) N. N. asks: Can you tell me if there is any way of preserving flowers so as to retain their color and shape? A. Valuable information on the subject of your query will be found in SCIENTIFIC AMERICAN, No. 23, vol. 66, also SUPPLEMENT, Nos. 745 and 1078. Price 10 cents each by mail.

(7214) W. L B. asks: (1) Can I obtain more voltage from a Leclanche battery by adding an extra amount of sal ammoniac to solution of standard strength? A. No. (2) What effect would it have? A. The solution should be saturated, and any extra amount would settle to the bottom of the cell in solid form. It injures the cell. (3) If I put in an extra amount of water, and sal ammoniac in proportion, will I obtain greater amperage; and if I put in only enough solution (standard strength) to cover but one inch of the zinc and carbon, will I have the same voltage as if the ordinary amount is used? A. Answer to both parts of question, yes. The voltage is the same, no matter how little, of only one or of both plates are in the liquid. The amperage increases proportionally to the increase in the area of the plates, because the resistance decreases in proportion to the increase in the area of the plates. (4) Will an ordinary one horse tread power be sufficient to run an eight light dynamo? and would the power be sufficiently steady? A. It would run the dynamo, but a horse power will not run a dynamo steadily enough to light lamps.

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SEPTEMBER 14, 1897,

AND EACH BEARING THAT DATE.

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Brick machinery, A. Gord ... 589,892
Bridles, headstalls, etc., guiding device for, O. R. Routh ... 589,859
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Fence post, J. B. Johnston ... 589,898
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(Continued on page 206)

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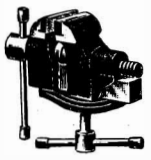

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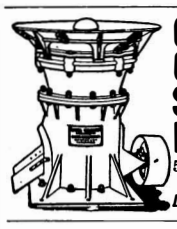

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Hat fastener, E. B. Alexander	589,888
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Pump, force, A. Munden	590,161
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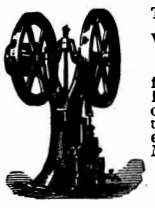

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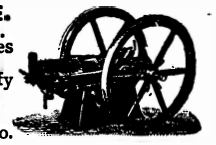

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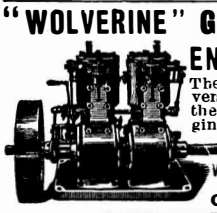

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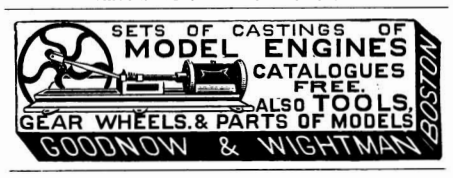

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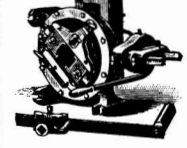

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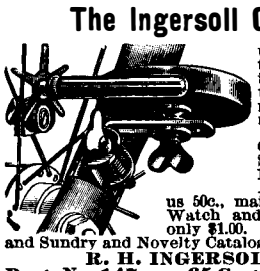

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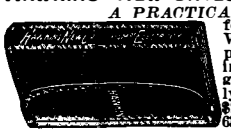

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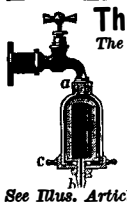

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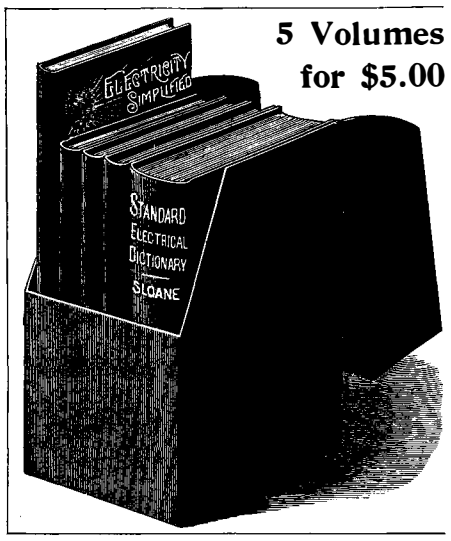

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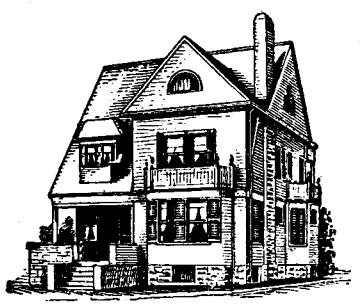

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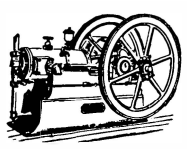

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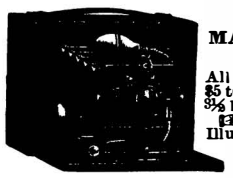

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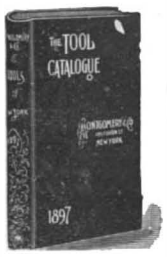

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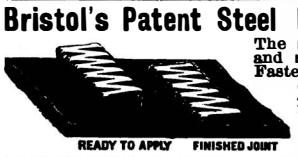

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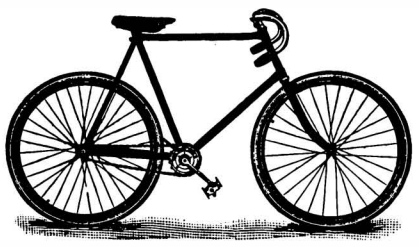

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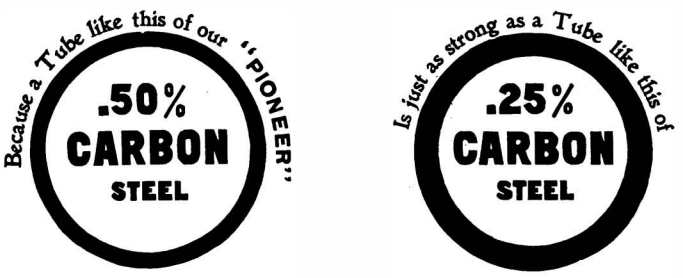

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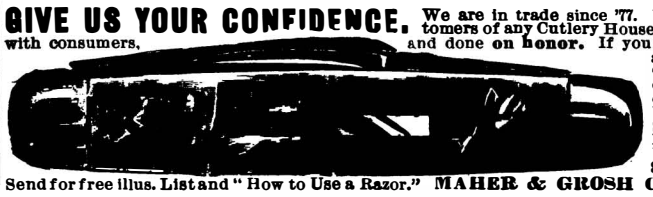

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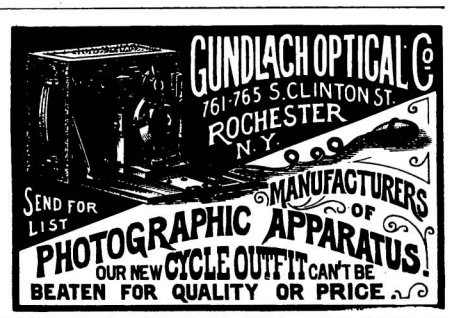

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